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A COMPARISON OF THE CONSONANT SYSTEMS OF THE RUSSIAN AND HUNGARIAN LANGUAGES FOR THE PURPOSE OF TEACHING RUSSIAN PRONUNCIATION TO HUNGARIANS

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Introduction

There is no doubt of the actuality of a comparative description of languages from the theoretical and practical point of view as there are many general and specific questions which have not been solved in applied spheres, particularly in teaching Russian phonetics to foreigners.

Russian is a consonantal type of language. That's why consonantism plays a dominant role in its phonological system as well as in speech sound combinations, whereas in Hungarian vocalism dominates.

The audioanalyses of Russian sounds pronounced by Hungarians learners and also difficulties in teaching Russian pronunciation show that numerous mistakes occur in the pronunciation of consonants. Namely this explains, first of all, the necessity of describing the consonants' system of these two interacting languages.

Describing contrasting phenomena in the systems of consonantism in the Russian and Hungarian languages and their reflection in the Russian speech of Hungarians, we tried to bear in mind the following factors: differences in the composition of phonems, their distribution, the relations of their system of phonems, differences in the complex of distinctive features, their phonetical realization and functional value, differences in the perceptive and articulative basis of the languages. A special part is played by the leading feature of the Russian phonological system, that is, the feature of hardness and softness of consonants which is realized in very different changes of consonants in place and mode of formation.

Methods and Material.

We brought out the contrasting phenomena in the Russian and Hungarian consonant systems through an analysis of research literature and composing a test card containing a prognosis of sound interference. In doing so we took into consideration materials obtained over many years of observations regarding sound interference in the Russian speech of Hungarian teachers of the language. The test-prognosis, consisting of semantic entities, (mainly separate words) was then proposed as an initial test for Hungarian teachers.

They were required to read texts which they had not seen before and were recorded in a studio in order to detect actual deviations in accent. One group of persons received a list of words with the consonants of the words marked. The other group did not have the consonants marked. The auditive analysis of the recorded speech was made by native Russian speakers, i.e., students and laboratory assistants. They were asked to detect the presence or absence of deviations in the pronunciation of the indicated consonants in a word and, if such deviations existed, to characterize them. Research will be carried out at a later date on normal and accented patterns in order to determine acoustic parameters, in which the pronunciation of the given consonant is appraised as an accent by Russians.

Results and Discussion

Let us take a closer look at some results of the analysis of consonant systems which depend on the distinctive feature of hardness-softness typical of the Russian language. Taking into consideration the various approaches to the phonetic essence of this category in linguistic literature, we explain which point of view we follow: "In pronouncing soft and hard consonants, it is not possible to divide the work of the tongue into basic and supplementary;" "Hard and soft consonants exclude one another in articulation." (4). In all hard consonants there is a characteristic pharyngheal localization of the body of the tongue, connected with the initial motion of the tongue towards the back or the upper back. In the case of all the soft consonants there is a characteristic frontal-median localization of the tongue in a rounded dorsal form and motion in the up-front direction. The features of hardness or softness occur throughout articulation of the sound (4).

The Hungarian consonant system in which the distinctive feature of hardness-softness is absent, is characterized by activity in the palatal zone, with limited correlation between the palatal and non-palatal in locus. On the one hand, the correlation between the palatal and non-palatal causes specific difficulties for Hungarians; on the other hand, bearing in mind the phonologicaldivergences of hardness-softness in the Russian and the palatal-non-palatal in the Hungarian, it is possible to use the articulatory practices of the native language to form the mechanism of a Russian articulation base. Articulation of the palatals (see K. Bolla) enables Hungarians to master fairly quickly"the articulation of Russian very soft consonants" (5). However, it is not enough for the formation of a hardness-softness mechanism. Practice has shown that no less, and perhaps even more, attention should be paid to phonetic drill of the Russian hard consonants which are characterized by specific pharyngheal localization of the tongue, features not typical of the Hungarian language, i.e., Hungarian consonants, except for the palatal, are neither hard nor soft, only neutral.

Even the place where the Hungarian velars [k] and [g] take shape is slightly to the fore as compared with the

Russian. Moreover, because the vowels dominate in Hungarian words and syllables, the consonants may be partially palatalized in the initial or end phases of articulation if they stand before or after the front-row vowels.

Thus, whereas Hungarians do not recognize the palatals of their language as soft because of their other function--palatals which the Russian ear takes to be soft--the rest of the Hungarian non-palatals are not always taken by the Russians to be hard and may be assessed by them as softened or even soft. That is especially true of the consonants [ш], [ж] and [л], which in the Russian are differently articulated than in the Hungarian and belong to the most velarized consonants.

Below is a summary of the results of the auditive analysis by a Russian audience of the accent deviations recorded in the Russian speech of Hungarians.

It should be noted that the marks on the consonants during the initial test did not essentially affect the results. Due to lack of space, details of the positions found in the course of the experiment are not given in the tables, and a limited number of examples are given. Practically all audience assessments are given.

Soft Consonants — Table 1.

Consonants	Assessment of Audience	Positions	Examples
п'б'ф'в'м' с'з'к'г'х'	hard, not very soft	before IиI, IeI	носи, белый, легенда, стихи
р'	hard	at beginning of word C'V in intervocals VC'V at end of word in compositions C'C'CC' C'C	ряд, реки, рисунок порядок, курю словарь горький, зрение, горько
ш̄' ч'	hard	at beginning of word C'V in intervocals VC'V at end of word in compositions C'C'CC'C'C	щель, часто защита, начало мощь, врач речки, речка овощной

Note: The consonants Iт'I, Iд'I, Iн'I, Iл'I were always assessed as soft, though in some cases the specific quality of the softness of Iт'I, Iд'I was pointed out.

In Table 2 the positions of the hard consonants before the vowel IыI. , are left out, because the consonants are in most cases assessed as a combination of hard with the following IиI .

Hard Consonants Table 2.

Consonants	Assessment of Audience	Positions	Examples
п б ф в м с з т д н	soft, softened not hard	before IэI	об этом, ВНР, теннис
ц	soft; soft Iт'I	before IыI, IэI after IиI, IеI at end of word	лекция, сцены синиц, молодец
к г х	soft, softened, not hard	before IэIи"э", "и" after IеI, IиI at end of word in combinations CC'	к этим, к Ире, ГДР всех, физик книга, где, хлеб
л	soft, softened, not hard	at beginning of word CV in intervocal VCV at end of word VC in combinations CC CC C C	лодка, лук молод, дала стул, ходил несла, молча, прочла
ш ж	soft, not hard	at beginning of word CV in intervocal VCV at end of word VC in combinations CC, CC C C	шум, жёлтый ноша, может нож, стоишь одежда, жди меньше

The data in the tables indicate that Russians tie the deviations in the Russian speech of Hungarians to the consonants and assess them as an infraction of the hardness or softness of consonants. As for deviations in the pronunciation of vowels, they usually are not noticed, even when the vowel is quite incorrectly articulated, although it is known that even in the joinder of soft and palatal consonants with vowels in syllables like C'V, C'VC and VC', CVC' the pattern of length and intensivity of the transitional part of the vowel in Hungarian is different from that in Russian (2).

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PROSODIC PROCESSING IN FRENCH AND AMERICAN INFANTS' BABBLING

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The aim of this study is to analyse some control mechanisms involved in infants'speech production. At an age where articulatory precision is emerging, but word and sentence structures are not yet mastered, motor and linguistic control is best illustrated by prosodic and rhythmic properties of utterances. We use here a cross-linguistic comparison of French and American infants'vocalizations in order to separate the influence of target-language from universal physiological constraints. Two kinds of speech dimensions should have a critical value, for their organization is specific of each language: timing and fundamental frequency (F_0).

Syllabic duration organization is well characterized by syllabic lengthening. French has a dominant final accent, marked by a final lengthening: the last syllable of a linguistic unit is always the longest, whatever the number of syllables be. In contrast, English patterns are much more intricated: an accented syllable is always lengthened, but its position depends on lexical item phonotactic structure and phrasal context. In disyllabic nouns, the accented syllable is usually the first one (4, 5). Stress is mainly marked by a wide-ranged F_0 movement, usually upward, when in non final position, and a falling accent contour when in prefinal and final position. In contrast, F_0 movements in French language have not such a linguistic function and depend mainly on the length of the utterance and on its syntactic-semantic structure (2, 9).

If we assume that infants are aiming to adjust their utterances to the mother language model, a reasonable hypothesis is that French children control rather well syllabic timing, the main characteristic of their mother tongue prosody, whereas American children approximate more accurately F_0 salient cues. However, co-occurrence of syllabic lengthening and pitch strong variations, which rather reflects universal physiological maturation, might be found in both language.

Previous studies on prosody acquisition have shown that pitch contrasts, that consist of rising and falling contours, are found in 16-month-old French children (3). In English, no discontinuity was found between babbling and first language pitch contours (7). English speaking children, at age 2, have a better "pitch tonal control" than "rhythmic durational control" (1). Pitch control correlates with the predominance of high tones on the first syllable of disyllabic items and falling contours on the last. The regularity of this high tone is sufficient to mark the contrast between stressed and unstressed syllables. On the contrary, durational patterning is not well mastered until 36^+4-month-old (1). However, the final syllabic lengthening, which is not found at 12-months (6, 8) appears clearly at around 14 months (8). Stressed syllables tend to be longer than the other ones.

The influence of mother tongue will be looked for primarily by analysing syllabic durations: we expect a more systematic final lengthening in French than in American infants'utterances; As for pitch, its movements should be larger for American infants, and appear regularly on the first syllable (high tone) or the last one (falling contour). Finally, the relation between pitch movement and syllabic lengthening might be found non language-specific, and, rather, linked to the level of motor control.

METHOD

Subjects and recording procedure: seven 11;10 to 14;06-month-old infants were recorded in Paris (2 girls and 2 boys) and San-Francisco (3 girls). The two recording sessions (1/2 hour) took place in the children's homes in the presence of the mother. At the age of the recording, children were producing about 4 intelligible words during a session.

Table 1. Total number of utterances

	2 syllables	3 syllables	4 syllables
French	121	44	23
American	49	42	14

Acoustic analysis: syllabic segmentation of 2 to 4 syllable utterances (Table 1) has been carried on by visual inspection of the amplitude envelope. Most of the productions including nasals, liquids or uvulars have been rejected. F_0 and syllable durations were measured for the retained utterances, the measurement accuracy being 5Hz and 10ms, respectively. Mean F_0 initial value was measured. The level of F_0 was considered High when above this mean value, Low when below. For each syllable, F_0 movement has been characterized by its starting point and the form of its slope: Flat (initial to final difference less than 50Hz), Rising or Falling (rapid downward or upward movement, more than 50Hz), Rising and Falling on the same syllable.

RESULTS

Table 2. Mean syllabic durations of initial and final syllables

		2 syllables	3+4 syllables
French	first syllable	247 ms	242 ms
	last syllable	246 ms	320 ms
	lengthening	0%	32%
English	first syllable	286 ms	294 ms
	last syllable	354 ms	323 ms
	lengthening	24%	10%

Table 2 summarizes the results of the syllable duration analysis. For French speaking children, the more striking result is the discrepancy between a large final lengthening for 3-4 syllables sequences and the lack of such a lengthening for disyllables. This last result is due to an almost equal number of lengthened and shortened final syllables. English data go in the opposite direction: no systematic final lengthening exceeding 20% is found except for disyllables, for which lengthening is significantly more frequent than reduction (sign test, $p < .01$), even if data dispersion is rather important.

Pitch analysis shows that there are some important differences between French and American infants. First, mean initial F_0 value is lower for French infants (298Hz to 371Hz, depending on the child) than for American ones (397Hz to 432Hz). In 80% of the utterances, F_0 range varies from 200Hz to 500HZ for French infants, from 250Hz to 600Hz for American infants. Second, the rate of F_0 change (Hz/ms ratio), computed on all pitch movements (rising or falling) exceeding 20Hz, is significantly lower for French children. Mean value of this ratio ranges from .348 Hz/ms to .703 Hz/ms (overall mean value: .608 Hz/ms) for French infants, and from .726 Hz/ms to .986 Hz/ms (overall mean value: .868 Hz/ms) for American infants, as shown in Figure 1. Averaged ratio is significantly different after clustering of values in 4 classes (X^2=10.67, df.=3, $p < .05$). These data show that pitch movements are significantly steeper in the American group than in the French one.

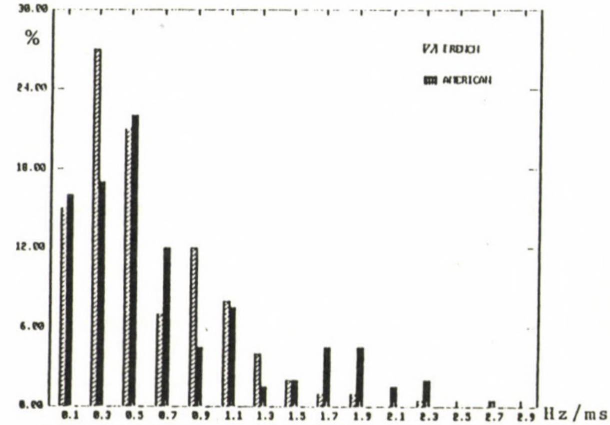

Figure 1- Hz/ms ratio distribution (in %) for each infants'group (X axis: class central values).

Analysis of prosodic patterns on each syllable shows that the main pitch movement is more frequent on the first syllable in French babbling than in English babbling, the number of syllables in the utterance notwithstanding. For instance, 11.5% only of English disyllables are accented on the first syllable vs. 36% for French, and 48% on the second syllable vs 35%. It is worth noting that this result is in agreement with disyllabic timing structure. A closer inspection of the pitch contour shows that, in French, lengthened first syllables are characterized by a steep rise, followed by a plateau (22%). This kind of prosodic contour is very infrequent in English babbling, where lengthened initial syllables exhibit a downward pitch movement followed by a low level plateau. Falling contours on the second syllable are almost twice as frequent than rising contours in both languages (23% or 21% vs 10.5% or 13.5%), but English babbling is also characterized by specific rise-falls on the second syllable (14%).

On the whole, large pitch movements (exceeding 50Hz) and lengthening (exceeding 20%) co-occur rather frequently, in 55% of French utterances, and 60% of English utterances. Large pitch movements are associated with syllable shortening in only 9% (French) or 11.5% (American) of utterances. The remaining utterances do not exhibit large pitch movements.

DISCUSSION

The comparatively high frequency of falling contours in both American and French babbling, which has also been found in previous studies, may be explained by physiological constraints. Pitch contrasts are often associated with end of breath group expiration. Initial rising contours in French disyllables are consistent with low initial F_0 values.

Two main conclusions may be drawn from our data:

- babbling displays not only a tonal structuration (1), but also a durational one. 11-to-13-month-old infants are able to synchronize pitch and timing control, at least for most of their vocalizations.
- at the same age, a discrepancy between babblings is emerging: pitch movements are steeper in American babbling, as shown by Hz/ms ratios, F_0 range is wider, specific rise-fall contours on the same syllable are not infrequent. These characteristics may be viewed as precursors of English stress, although our data are still insufficient to draw a definite conclusion. In French babbling, pitch movements are relatively smaller, and their position seems to be less constrained. This would agree with the "freedom" of pitch use in French language. Timing control is more appearing, especially for 3 to 4 syllable utterances, in which final lengthening consistently occurs. It can be viewed as a precursor of French final accent. We hypothesize that French infants use a prosodic representation, but only when they utter a "regular" prosodic group, including initial, pre-tonic and tonic syllables.

To summarize, we claim that, at a time when articulatory precision is rather good, but utterances still unintelligible, infants use mechanisms of pitch and timing control, whose certain features could be the first step towards acquiring the target language prosodic system.

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ANALYSIS VOWEL COARTICULATION IN CONTINUOUS SPEECH

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The objective of this communication consists on doing an acoustic analysis of the vocalic reduction phenomenons which appear in Spanish and Catalan when two vowels are closed in spontaneous speech.

PROCEDURE

Our investigation is based on continuous speech, for that reason the corpus has been obtained from the recordings of two informants, a Spanish one and a catalan one. They have been informally interviewed for about three hours.

Working with continuous speech has a lot of problems. The main problem is that the corpus is not as long as we would have desired because some of the examples we are looking for are not in the recording we made previously. For that reason we had to reduce the study we had planned before, because there are not enough cases to realise a statistic treatment.

For Spanish language we started from a corpus of 370 examples, 71 % of these exemples are cases of complete reduction , 15 % are cases of partial reduction and 14 %correspond to pauses.

In catalan the results are quite the same. From a corpus of 272 examples, 77 % correspond to complete reduction, 11 % are partial reduction and 12 % where there is no reduction. These different levels have been established listening to the recordings and afterwards they have been demostrated in the acoustic analysis.

There were some differencies in those cases because of the position of the accent. We have found four situations:

a) V V́

b) V́ V

c) V V

d) $\acute{V}\ \acute{V}$

In the context d) in Spanish we have not found any cases while in catalan we have found only two.
In the cases a) and b) there were not enough examples to determine a statistic basis so we have only taken into account those cases where the vowels in contact are unstressed. In this situation we have not worried about vowel combinations like [-i i-], [-0 0-] (for catalan there is also [-u u-]) where the cases were very few as you can see in the tables given below.

SPANISH	Complete reduct.	Partial reduct.	Pause
[-a a-]	73	27	22
[-e e-]	175	20	21
[-i i-]	2	1	0
|-o o-|	1	6	7

CATALAN	Complete reduct.	Partial reduct.	Pause
[-əə -]	190	28	31
[-i i-]	1	0	0
[-u u-]	0	0	1

The consonantic context is another problem. Vowel duration and frecuency change depending on the point of adjacent consonantes articulation. To study with precision the facts that appear when two vowels are in contact we have thought it was necessary to homogenize the consonantic context. The context that provided us whith the widest corpus was this one: alveolar or dental consonant -V V- alveolar consonant.

After selecting the corpus, we based our study on the spectrographic analysis. The parameters we have taken into account are:

-Duration of the first and second formant (d1, d2 respectively).

-Frecuency of the first and second formant in three points:

-initial point (F1.1, F2.1)

-steady point (F1.2, F2.2)

-final point (F1.3, F2.3)

RESULTS

After doing the statistic treatment the results are these.

Complete reduction	D1	F1.1	F1.2	F1.3	D2	F2.1	F2.2	F2.3
[-a a-]	.46	487	497	475	50	1404	1410	1432
[-e e-]	47	413	448	304	47	1712	1736	1765
[-ə ə -]	50	462	482	491	51	1506	1514	1529

Partial reduction	D1	F1.1	F1.2	F1.3	D2	F2.1	F2.2	F2.3
[-a a-]	153	513	600	565	151	1326	1300	1244
[-e e-]	68	430	428	461	66	1505	1574	1574
[-ə ə -]	307	467	565	413	296	1207	1163	1131

Pause (1st element)	D1	F1.1	F1.2	F1.3	D2	F2.1	F2.2	F2.3
[-a a-]	97	478	587	568	90	1392	1392	1424
[-e e-]	207	451	464	494	210	1715	1794	1829
[-əə-]	243	467	630	717	243	1310	1305	1337

Pause (2nd element)	D1	F1.1	F1.2	F1.3	D2	F2.1	F2.2	F2.3
[-a a-]	71	652	630	587	71	1272	1283	1261
[-e e-]	53	502	497	492	55	1837	1882	1875
[-əə-]	56	636	690	701	52	1283	1261	1250

CONCLUSIONS

Analysis of acoustic parameters show us that there is nearly always a complete reduction when two vowels are closed in fluent speech.
On the other hand, in the case of a pause the duration of the first vocalic element is longer than the second one. This finding is consistent for all vowels and speakers. The duration of the second formant and the duration in cases of complete reduction are similar.

A second finding of the present study is that, in general, the second formant frecuency in the examples of parcial reduction is lower than the second one in the other cases.

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A STUDY OF COHESIVE TIES IN CHILDREN'S NARRATIVES

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The purpose of this study is the examination of cohesive ties in the narratives of Hungarian and Hungarian-English bilingual children. Our own work is linked to that of the Hungarian psychologist C. Pléh, who has demonstrated the importance of functional models in narrative recall (1987). The developmental psychologists Stein and Glenn (1979) studied retold stories by children of varying ages. They found that the recall of narratives is highly organized and that the amount of information recalled increases with age. In several studies of our own we found that children increase the quantity of their recall of narratives dramatically between the ages of 5 and 7 (John, Horner, & Berney, 1970).

In studies based on research done with Navajo, Hispanic, and Anglo-American children, we found interesting shifts in retold stories that apparently were linked to cultural differences in narrative traditions (John & Berney), 1968; Osterreich & John-Steiner, 1975). Other researchers have also found patterns of recall characteristic of specific ethnic groups (McClure, Mason, & Williams, 1983). Culture as a significant variable in both the production and the recall of narratives appears in Kintsch and Greene's findings (1978), which suggest that a culture-specific schema aids in both comprehending and reconstructing stories. Also developmental differences in children's recall have been found in the content as well as the structure of narrative effect. Of particular interest is the finding that younger children recall characters' actions while older children recall internal states (McConaughy, Fitzhenry-Coor & Howell, 1983).

In the research to be reported today, we use a story book with vivid large illustrations reflecting a Southwestern Indian context. The original story text was translated from English to Hungarian* and read to Hungarian public school children ranging in age from eight-and-a-half to nine-and-a-half. The stories were also read in English to bilingual children of Hungarian parentage who attended two different week-end Hungarian language schools in New Jersey and to other bilingual children who attended the St. Elisabeth school in Toronto, Canada.

Methods of Analysis

For the quantitative analyses we relied upon propositions as units (used in our previous work and also by most investigators, i.e. Bower, 1978; Pléh, 1984, etc.). Qualitative analyses included a reliance upon propositions as well as looking at larger units, including ways in which the children handled story-telling conventions. Our major focus is the analysis of cohesive ties. We differentiated between lexical and grammatical cohesion, relying in part on Halliday and Hasan's method of analysis.

Grammatical cohesive devices include reference (pronominals, demonstratives, comparatives), substitution, ellipsis, conjunction. Lexical cohesion ncludes reiteration, when "the use of general nouns as cohesive agents depends on their occurring in the context of reference--having the same referent as the item which they presuppose, this being signalled by the accompaniment of a reference item" (Halliday and Hasan, p. 277).

In addition to reiteration, lexical cohesive devices also capture more complex relationships. Examples of such devices in the data collected for this study are primarily complex verbs. For instance, "they fell asleep" (elaludtak);

"you may keep it" (megtarthatod); "I will take you up" (felviszlek). In addition, the story conventions frequently used by our subjects, such as "Once there was a little boy" (egyszer volt egy kisfiú). The simple lexical ties were reiterations of major agents in the story, such as "the black pony" (a fekete póniló). In these retold stories, simple syntactic devices included "the," "here", "there", "and", "and then", among others. Two examples of the more complex syntactic devices are "meanwhile" (eközben) and "suddenly" (hirtelen).

We have chosen to compare three groups of retold stories: those obtained from bilingual children (four subjects: I, J, K, L); four stories obtained from children native to Hungary (A, B, C, D), whose stories appeared to be particularly accomplished; and lastly, four children from the same group of native speakers of Hungarian (E, F, G, H), whose stories did not seem to be equally striking.

The following tables summarize these analyses:

Table 1: Total Number of Cohesive Ties and Propositions

KEY: SG = simple grammatical; CG = complex grammatical; SL = simple lexical; CL = complex lexical

MONOLINGUALS	No. of Prop	SG	CG	SL	CL	Total no. of C.T.	CT / Prop
Child A	50	47	18	6	13	84	1.68
Child B	63	93	25	11	21	150	2.22
Child C	90	78	37	46	26	187	2.08
Child D	58	58	22	26	7	113	1.95
T =		276	102	89	67	(534)	
Child E	53	42	18	24	24	108	2.04
Child F	51	64	17	19	13	113	2.22
Child G	40	55	13	14	6	86	2.15
Child H	44	54	14	14	10	92	2.09
T =		215	62	71	53	(401)	
BILINGUALS							
Child I	38	59	26	7	7	99	2.60
Child J	36	40	20	6	5	71	1.97
Child K	28	16	3	9	0	28	1.00
Child L	32	49	6	2	1	58	1.81
T =		164	55	24	13	(256)	

Table 2: Percentage of Different Cohesive Ties

MONOLINGUALS	SG	CG	SL	CL	Total no. of C.T.
Child A	.56	.21	.07	.15	84
Child B	.62	.15	.08	.14	150
Child C	.42	.20	.25	.14	187
Child D	.51	.19	.23	.04	113
Child E	.39	.17	.23	.23	108
Child F	.57	.15	.17	.12	113
Child G	.64	.15	.16	.06	86
Child H	.59	.15	.15	.11	92
BILINGUALS					
Child I	.60	.26	.07	.07	99
Child J	.56	.28	.08	.07	71
Child K	.57	.10	.32	0	28
Child L	.84	.10	.03	.04	58

There are no large differences in the percentage of cohesive ties used by the children in these three different groups (although these children do differ in the length of their stories). Bilingual children rely upon simple grammatical cohesive ties to a large extent; monolingual children, while using these extensively, also use complex lexical ties to enrich their narratives. In addition, monolingual children use complex grammatical ties to provide a particularly effective coherence to their retold stories.

Qualitative Analyses

In examining these narratives closely, we find the presence of long cohesive chains built up out of lexical relations. The most accomplished story tellers use vivid adjectives which make their stories more coherent. Additional narrative strategies can be illustrated in the following way:

Child A relied to a great extent upon temporal adverbs in her narratives, such as "he only noticed when" (akkor vette csak észre). Movements are strongly marked with the following construction: Adv + Verb + Locative + Noun + Possessive: "there went to them their mother" (odament hozzá az anyjuk). The child's sophisticated use of verbal prefixes signals the nature of the movement depicted; it helps to differentiate on-going and completed actions which further provides for story cohesion. While this child produced a relatively short retold story--50 propositions as compared to the original 97 propositions--her use of these stylistic and cohesive devices produced a strong narrative.

Child B frames his story by stating, "He will be given (such) a black pony" (fog kapni egy ilyen fekete pónilovat) and 42 propositions later, he returns to this theme: "and he received the pony from his father" (és megkapta a papájától a lovat). This latter statement is an addition to the original story, but it is a logically consistent one, which provides a certain roundness to the tale.

Child C told the longest and most complete narrative. He starts the story in a typical story-telling mode:

1. Jancsi és apukája egyszer estefelé vacsorázott.
   (Once Jancsi and his father were eating at suppertime.)
2. Ült a tűz mellett és apukáját megkérdezte:
   (He was sitting near the fire and asked his father:)

He uses repetition as an effective narrative device. He adds interesting and original material to the story.

While the bilingual children's uses of complex Hungarian forms were limited, their reliance upon both simple and complex cohesive ties was quite striking. (One important exception was their limited use of complex lexical ties.) At the same time, we found examples of narrative strategies, such as child J, who constructed cohesion by linking the first proposition with the last.

Thus, while the linguistic performance of the bilingual children clearly revealed that Hungarian is their weaker language, some of them showed a cognitive maturity which corresponds to Maya Hickman's findings (1985) that there is a strong developmental improvement in children's use seen as equivalent in their performance to very young native speakers; rather, their narratives provide an interesting blend of cognitive sophistication and linguistic limitations.

Conclusions

The quantitative and qualitative analyses of cohesive ties provided different, but complementary, insights into the narratives of these Hungarian and English/Hungarian- speaking children. The richness of the stories seemed striking when we first read them; the quantitative analyses showed that the best stories used complex lexical cohesive ties, while the less striking stories relied on both simple and complex grammatical means. The particular strength of the stories appeared to be linked to these children's thorough knowledge of narrative conventions of framing, and to the freshness of their perceptions concerning character and plot. This is of special interest as the story was situated in a far land, and takes place in a culture at great variance from the Hungarian children with whom we have worked.

While we have no systematic comparative data, as yet, for native-speaking children of this age range in the United States, we are prepared to argue that these stories told by Hungarian children are richer stories than those we have obtained from some comparable groups in this country. One possible reason for this story-telling proficiency is the high valuing of expressive language and story telling in Hungary. Thus these children, exposed to such a tradition, produce complex and cohesive narratives.

Notes

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SYLLABIC ISOCHRONISM IN ITALIAN AND ENGLISH.

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Introduction.

In a recent paper, Myers [6] suggests that the rules of English vowel quantity may be simplified considerably by assuming that a principle of syllabic isochronism (henceforth SI) is at work in the language. This principle takes care that stressed vowels be long in open syllables, and short in closed ones. Thus, one observes pairs such as *keep~kept*, *wide~width*, *reduce~reductive*, *retain~retention* etc. The first examples in each pair might appear to contain closed syllables; but in those cases Myers assumes that the final consonant is extrametrical, according to a hypothesis independently put forth by several linguists with respect to a number of phonological problems in different languages (notice, incidentally, that this treatment should be extended to final sequences of more than one consonant, as in *sound*, *mould*, and even *whilst* in some dialects). Conversely, one finds words such as *sanity*, where a short vowel shows up in what might be looked upon as an open syllable. However, Myers assumes, according to the 'resyllabification rule' lately reproposed (among others) by Borowsky [4], that the consonant following the stressed vowel is attracted by the strong syllable, moving from onset position to the preceding coda (*sa-ni-ty* > *san-i-ty*).

However, not all words of the English lexicon behave as predicted by the assumed resyllabification rule. Myers himself lists a number of exceptions, such as *seasonal*, *dynasty*, *basic*, *mammalian*, *newtonian* etc., where the shortening does not occur. In addition to these, one might observe that quite a number of monosyllables, containing a short vowel and ending in a consonant, apparently skip the extrametricality rule (cf. *push*, *pull*, *bit*, *sin*, *net*, *bet*, *book*, *foot*). Presumably, these must be marked as lexical exceptions. Nevertheless, Myers claims that SI covers the large majority of the items, and advocates a number of merits to his proposal. Namely, SI is considered to be: (a) a natural process, inasmuch as it occurs in several languages other than English; (b) a strictly local, and therefore theoretically welcome, process; (c) a historically motivated principle, inasmuch as it may easily be documented with lexical materials taken from Early Middle English.

As to point (a), see for inst. Maddieson [5]. One major problem consists, however, in assessing the different degree of obedience to this tendency. Obviously, in many languages SI is a purely allophonic adjustment to syllabic structure, without phonematic (in the Praguean sense) purport; besides languages differ among themselves in their degree of compliance with it. This is relevant also with respect to point (c) above: historical evidence is all but illuminating where there is no transparent evidence that the principle of SI is significantly at work at the synchronic level. This is precisely the matter with which I am going to take issue in what follows.

Method.

Five English (three British and two American) and five Italian subjects (all from Tuscany) took part in the experiment. They were all payed volunteers.

The main difficulty consisted in finding speech materials which would suit both groups, despite the phonological differences characterizing the respective languages. The best compromise consisted in making use of disyllables stressed on the penult, having either an [i]-like or an [u]-like stressed vowel. The reasons for this are as follows:

- stressed final syllables had to be avoided, both because final closed syllables would be highly marked in most cases in Italian, and because that is precisely the place in which Myers would invoke the extrametricality rule;

- [i,u] are the only tense vowels in English which might serve the purpose, in so far as they are acoustically close enough to their lax cognates [I,U], although they show a tendency to diphthongize to [ij,uw]. Thus, if indeed SI is at work, it might be assumed that English subjects would select the appropriate vowel (tense or lax) in the appropriate context, i.e. depending on syllable structure. Needless to say, [i,u] and [I,U] are not cognates in the vowel shift phenomenon: but this point is not at issue here.

In addition, the intervocalic clusters had to be representative of allowed consonant sequences in both languages. Also, the final vowel had to be acoustically similar in both languages, and lax in English, where two tense vowels in adjacent syllables are highly marked.

To avoid as far as possible the production of existing words, the following items were used in the experiment:

English: *s...py ~s...psy* *s...ty ~s...tsy* *s..fy ~s..fti*
Italian: *s...pi ~s...psi* *s...ti ~s...tsi ~s...zzi* *s..fi ~s..fti ~s..ffi.*

Three main sets of consonants were used: bilabials, dentals and labiodentals (further items containing sonorants are not reported on here). Notice that the Italian subjects produced two items more than the English. Namely, the orthographic sequence (actually, an affricate) <zz> was used to check whether the subjects' behaviour was somehow influenced by the quite unusual sequence <ts> (phonetically, though, they both correspond to the same articulation). Similarly, the geminate <ff> was used as an alternative to the rarely occurring cluster <ft>. The statistical analyses were separately performed with respect to either the less or the most common sequences, in order to have both a fair comparison with the task fulfilled by the English subjects, and a reliably natural behaviour.

The items were randomly presented on individual cards. Each item had to be read 7 times (of which, the first and the last were discarded in the acoustical analysis). First, the subjects were instructed to replace the dots with an [u]-like vowel. When the reading of all cards was completed, they were asked to repeat the task by filling in an [i]-like vowel. Subsequently, the first series of cards was substituted by two similar ones, on which each item was fully spelled out: i.e., the dots were replaced by <u> or <i> for the Italian subjects, and by <oo> or <ee> for the English ones. Thus, there were two modes of production: phonetic vs. orthographic. The orthographic mode was used in order to control for the effect of the unusual task demanded of the subjects in the first part of the test. On the other hand, the phonetic mode was considered a convenient device to avoid the possible interference of spelling, particularly intrusive in English.

Altogether, the design of the experiment was as follows:

- **LAN**(guage)= **ITA**(lian) and **ENG**(lish); **SUB**(ject)= five for each LAN; **MO**(de)= **PH**(onetic) and **OR**(thographic); **SYL**(llable)= **OP**(en) and **CL**(osed); **VO**(wel)= **[i]**(-like) and **[u]**(-like); **CO**(nsonant)= **B**(ilabial), **D**(ental), **L**(abiodental), with the possible alternative of **A**(ffricate) and **G**(eminate); the last two cases with closed syllables only. The dependent variable was the duration of the stressed vowel, measured in msec.

Results.

The measurements were performed on a McRecorder device, produced and distributed by Farallon Computing Inc. (Berkeley, Ca), which runs on a McIntosh personal computer. Tab. 1 shows a selection of the mean values obtained. The statistical analyses consisted in a number of ANOVA tests, coupled with pairwise *t* tests. In the limited space available, only the most relevant data will be reported here. The analyses were run separately for the Italian and the English subjects.

All the main factors are **SIG**(nificant), although MO is most of the time involved in non-SIG interactions, and is plainly non-SIG for ENG alone. Thus, this factor is of secondary importance; and this is a welcome result, for it suggests that the PH mode was not at all disruptive. As for the remaining interactions, only SYLxVOxCO turns out non-SIG in the overall statistics, both for the model with B,D,L and that with B,A,G (the last ones, obviously, only in CL). In the latter case, also the interaction LANxSYLxVO is non-SIG.

The results of the pairwise *t* tests for the factor SYL (i.e. OP~CL), which is the ultimate target of the test, are shown in tab. 2. The picture which emerges varies considerably according to the selection which is made within the ITA data. When D and L are taken alongside B, all values are SIG (in only two cases moderately so, that is at the .O5 rather than .O1 level). When A and G replace, respectively, D and L in CL syllable, the situation for ITA becomes more similar to the ENG one: there are four non-SIG values, all concerning a specific CO, or some intersection of VO and CO. As for ENG, there are eight non-SIG values and four SIG ones.

Discussion.

The present output suggests the following interpretation. The difference between the two LAN, which is relatively striking when D and L are included in the set, tends to reduce when A and G are taken for the CL syllable. Notice that A and G represent two fairly common units in Italian phonology, whereas D and L belong here to quite unusual clusters. This invites the hypothesis that, despite the very large difference in mean duration values observed in tab.1, the opposition OP~CL is far from absolutely stable even in ITA: a result which is not particularly surprising, given the picture reported in

Bertinetto [1]. The contrast of long and short vowels, depending on syllable structure, although routinely described as a characterizing feature of ITA, is in fact relatively erratic.

But if this is so with ITA, then it must be even more so with ENG, considering the very narrow difference, in terms of mean duration values, between OP and CL (see tab.1). Consequently, Myers' hypothesis concerning the supposed principle of SI in ENG should be regarded with suspicion.

In a larger version of this paper, I discuss a number of conceivable objections, which might be raised against the experimental procedure adopted. To conclude, let me just note one point, concerning the epistemological status of the SI hypothesis. This principle looks unsatisfactory not only because of the many exceptions, but mostly because it incorporates a conjunction of two devices for the sterilization of contrary evidence, namely the extrametricality criterion and the resyllabification rule. It would be equally plausible to assert that syllable structure, rather than determining vowel length, is determined by it: indeed, the consonant is considered extrametrical just in case the vowel is long.

TABLE I

Duration in msec. of the target vowel, with respect to some specified factors.

		English	*Italian (B,D,L)*	*Italian (B,A,G)*
SYL	*OP*	114.68	196.73	196.73
	CL	107.53	131.66	141.09
MO	*PH*	111.74	159.21	163.54
	OR	110.47	168.69	174.29
VO	*[i]*	117.31	165.00	170.71
	[u]	104.90	162.90	167.11
	B	107.32	161.54	161.54
CO	*D*	114.05	168.86	175.62
	L	111.94	161.45	169.58

(NB: except for the factor SYL, all other data refer simultaneously to both open and closed syllables.)

TABLE II

Results of the pairwise *t* test for the factor SYL (OP~CL) with respect to various subsets of the data.

	English	*Italian (B,D,L)*	*Italian (B,A,G)*
All	SIG	SIG	SIG
[i]	SIG	SIG	SIG
[u]	non-SIG	SIG	SIG (.05)
B	non-SIG	SIG	SIG
D / A	SIG	SIG	SIG
L / G	non-SIG	SIG	non-SIG
[i] x B	non-SIG	SIG	SIG
[i] x D / A	SIG	SIG	SIG (.05)
[i] x L / G	non-SIG	SIG	non-SIG
[u] x B	non-SIG	SIG	SIG
[u] x D / A	non-SIG	SIG (.05)	non-SIG
[u] x L / G	non-SIG	SIG (.05)	non-SIG

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Tendances de neutralisation des oppositions entre voyelles nasales dans le français parisien.

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Le déclin de la nasale /œ̃/, le "désarrondissement" des lèvres, donc la transformation de la voyelle en /ɛ̃/, n'est pas un fait nouvau, Henri Bauche y voyait un trait constant du français populaire : "*un* (nasal) se prononce toujours *in* en LP" ((1920) 1946; 41). Le Père Desgranges signalait déjà en 1821 le barbarisme phonétique *qeqzain* "quelques uns" (1821; 180).

Ce phénomène a été l'objet d'une étude phonétique bien connue menée par André Malécot (1964).

1. Il existe deux autres rencontres plus récentes entre nasales :
(a) le /ɛ̃/ se déplace souvent vers /ɑ̃/, surtout dans la parole de jeunes parisiens;
(b) d'autres, font chevaucher /ɑ̃/ et /ɔ̃/.
Ces chevauchements gênent rarement la compréhension.Le nombre *quatre-vingt* prononcé [katʁəvɑ̃] correspond à *quatre vents* , les occasions où le contexte admettrait les deux séquences sont cependant rares.

Il est, toutefois, possible d'imaginer ou de créer des textes où l'écart entre les deux voyelles nasales soit indispensable pour la distinction des deux énoncés isolés. C'est le cas de phrases telles que:

C'est intérieur	*et*	*C'est antérieur*	*Il ronge tout*	*et*	*Il range tout*
C'était aux Indes	*et*	*C'était aux Andes*	*Non. Maintenons*	*et*	*Non. Maintenant*
Quel beau teint !	*et*	*Quel beau temps !*	*Quel beau blond !*	*et*	*Quel beau blanc !*
C'est Tintin	*et*	*C'est tentant*	*C'est tonton*	*et*	*C'est tentant*
Tu fais le plein ?	*et*	*Tu fais le plan ?*	*etc...*		

Dans des situations réelles le macro-contexte écarterait généralement l'un des deux énoncés. Dans la situation artificielle des tests de perception, les qualités acoustiques d'un seul segment vocalique devraient déterminer l'interprétation des énoncés semblables. Une liste composée de 78 phrases contenant les "nasales ambiguës" a été lue par cinq étudiantes et deux étudiants d'origine parisienne. Les différences individuelles (entre "idiolecte") étaient très marquées. Dans la parole de la locutrice A.E. les [ɛ̃] se rapprochaient dans certains énoncés de [ɑ̃]. Par contre, les autres locutrices, ainsi que le locuteur J.B. distinguaient clairement dans la plupart des phrases les deux nasales /ɑ̃/,/ɛ̃/ avec la netteté requise par la norme du français standard. Le locuteur J.B., toutefois, distinguait mal /ɔ̃/ et /ɑ̃/.

Par conséquent, les informateurs parisiens à qui nous avons présenté les énonciations enregistrées, en leur demandant de noter par écrit les phrases qu'ils venaient d'entendre (test à choix libre) ou de choisir entre deux phrases proposées (*C'est pas pour maman* vs *C'est pas pour ma main*), ont interprété correctement dans la plupart des cas les phrases distinguées par l'opposition /ɛ̃/ - /ɑ̃/ et /ɑ̃/ - /ɔ̃/ prononcées par ces trois sujets. (test à choix limité).
Il y a eu par contre plus de confusions à partir de la lecture de Mlle A.E. et de M. J.B. (tableaux).

Parmi les énoncés prononcés par la locutrice A.E. teinte est perçu "tente" 6 fois sur 11 au cours des tests à choix libre, et 9 fois sur 19 dans les tests à choix binaire; ma main est pris pour "maman" 11 fois sur 12 dans le cadre des tests à choix libre et 7 fois sur 28 par les participants du test binaire; éteins et éteindre glissent vers "étends" et "étendre". Au total, le /ɛ̃/ a été perçu comme /ɑ̃/ dans 51 cas sur 103 dans les tests à choix libre, 54 fois sur 325 cas dans les tests binaires. L'articulation linguale postériorisée est à la source des erreurs. Le déplacement inverse, l'antériorisation, était plus rare. Le /ɑ̃/ a été perçu comme /ɛ̃/ dans 7 cas sur 59 au cours des tests à choix libre et jamais dans les tests à choix binaire.

Les /ɔ̃/ délabialisés du locuteur J.B. sont souvent pris pour des /ɑ̃/ : ainsi, dans *ronge* (18 fois sur 27), *maintenons* (20 fois sur 33).

Ces tendances articulatoires se reflètent clairement sur les spectrogrammes. Dans la parole de ceux ou de celles qui distinguent nettement les trois nasales, les trois premiers formants présentent une configuration nettement différente pour /ɛ̃/, pour /ɑ̃/ et pour/ɔ̃/ (tableaux , figures 1 et 2). Les données relevées pour les nasales /ɛ̃/ et /ɑ̃/ perçues comme telles dans les tests de perception sont comparables à celles indiquées par Françoise Robert.

Dans les cas où /ɛ̃/ tend à être confondu avec /ɑ/ (loc. A.E.), la fréquence du 2ème Formant descend sensiblement et par conséquent la distance F2-F1 diminue. On remarque également que la voyelle nasale n'est pas stable: en position finale (voyelle allongée), A.E. commence sur[ɛ̃] et termine vers[ɑ̃]; sur les voyelles non-accentuées (brèves), le timbre se maintient. (Figure 3).

Dans les /ɔ̃/ du locuteur J.B. pris souvent pour /ɑ̃/ la distance F2-F1 est atypique, proche de celle des /ɑ̃/. (figure 4)

2- Pour déterminer les seuils de tolérance pour la perception des trois nasales, nous avons présenté des variantes synthétisées de la phrase *Quelle jolie teinte* à 15 étudiants en phonétique. Le programme de la synthèse a fait varier l'écart F2-F1 . Selon le résultat des tests, la position typique de F1 pour /ɑ̃/ est autour de 550 Hz et de 750 Hz pour /ɛ̃/; celle de F2 est autour de 1900 Hz pour /ɛ̃/ et de 1300 Hz pour /ɑ̃/.
Le /ɑ̃/ passe à /ɛ̃/ dans la perception dès que F2 dépasse 1600 Hz et que F1 descend au-dessous de 600 Hz.

Pour le cas de /ɑ̃/ qui tend vers /ɔ̃/, le passage se fait lorsque F1 = 600 Hz et F2 = 1000 Hz. Cette tendance est à comparer avec les observations de Veijo Vihanta (1978):
L'auteur a présenté des enregistrements de locuteurs français à des auditeurs finnois. Il a pu conclure, entre autres, que le /ɑ̃/ français était souvent (21, 4 % des cas) perçu comme /ɔ̃/. Le système phonologique et les habitudes articulatoires de la langue maternelle ont certainement joué un rôle important et il ne faudrait pas écarter la possibilité d'une tendance à la confusion de /ɔ̃/ et de /ɑ̃/ propre aux locuteurs francophones.

3- La variation occasionnelle et individuelle est si forte que pour mettre en évidence l'incidence du sexe, de l'âge, du caractère, de la situation sociale et professionnelle des locutrices et locuteurs il faudrait un corpus d'une importance telle qu'une analyse acoustique et perceptive des données serait pratiquement irréalisable. On peut aborder toutefois la question de biais. S'il y a un écart statistique significatif dans la tendance de neutralisation des oppositions vocales en fonction de l'âge des locuteurs, il faudrait supposer que les locuteurs plus âgés, qui distinguent soigneusement les nasales en question, prendraient plus facilement un /ɛ̃/ plus ou moins déplacé vers [ɑ̃] pour un /ɑ̃/ que les jeunes qui "pratiquent" le déplacement.

Des tests préalables faits avec 10 hommes et femmes entre 60 et 70 ans témoignent en faveur de cette hypothèse. Les /ɛ̃/ ambigus des jeunes locutrices sont perçus plus souvent comme /ɑ̃/ par les locuteurs plus âgés. Ainsi, *ma main* a été perçu 7 fois sur 10 par les plus âgés dans le cadre du test à choix limité, et 7 fois sur 28 par les jeunes. Le mot *plein* perçu 22 fois sur 27 par les jeunes est interprété comme *plan* 5 fois sur 10 par les plus âgés.

Les devoirs scolaires semblent aussi indiquer que la neutralisation est plus avancée dans la parole des jeunes: les fautes d'orthographe d'enfants de 6-7 ans reflètent souvent leur "conception phonologique" (Fónagy I. et P., 1971). A titre illustratif citons les exemples: <u>dessan</u> pour "dessin", <u>voisen</u> pour "voisin", <u>demen</u> pour "demain", <u>assassan</u> pour "assassin", <u>comman</u> pour "commun", <u>landi</u> pour "lundi" (S.M., 6 ans).

Nous sommes en train de mener une étude systématique dans une classe d'une école primaire de la région parisienne en utilisant ce même corpus adapté.

Nos tests ne permettent pas de juger de la valeur stylistique des variantes. On a l'impression que les variantes de /ɛ̃/ qui s'approchent de /ɑ̃/ font "plus jeune", "plus branché", "plus désinvolte". Il y a deux procédés qui pourraient justifier ce sentiment ou montrer qu'il s'agit d'une illusion. Le procédé le plus fiable serait la production de variantes. Après avoir reconstruit par resynthèse un énoncé tel que *C'est intérieur*, on modifierait la structure formantique du /ɛ̃/ en rapprochant graduellement cette structure de celle de /ɑ̃/, en réduisant la distance F2-F1. Il faut, bien entendu, que la synthèse soit de très bonne qualité, afin que le "bruit" soit interprété comme message. Nous n'avons pas encore réussi, à ce jour, à surmonter les difficultés techniques.

Ces premiers résultats indiquent que le système des voyelles nasales du français parisien est en train de se transformer. Après la perte de la nasale /œ̃/, les oppositions /ɛ̃/ vs. /ɑ̃/ et /ɑ̃/ vs. /ɔ̃/ sont également menacées. Le changement se déroule, cette fois encore, à travers un conflit entre variantes, inégalement distribuées dans l'espace social et ayant, par conséquent, des valeurs stylistiques différentes. Ces valeurs auront probablement une influence sur le déroulement du changement. Les variantes "plus branchées" risquent d'être adoptées par un nombre croissant de locutrices et de locuteurs.

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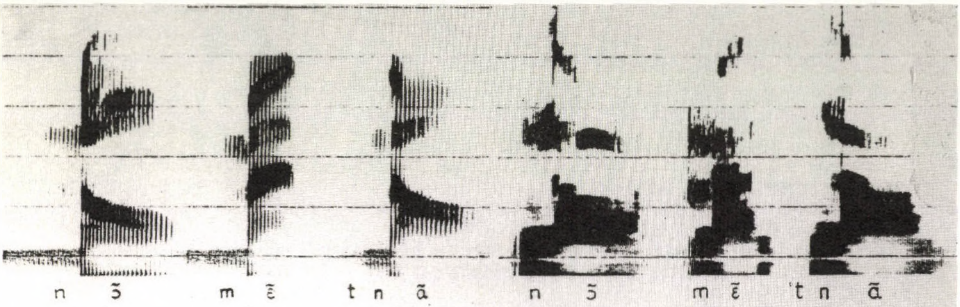
Tableaux.

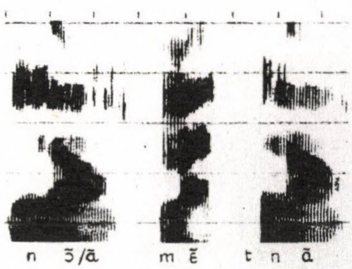
I / II		ɛ̃	%	ɑ̃	%	ɔ̃	%	ɛ̃	%	ɑ̃	%	ɔ̃	%
ɛ̃	libre	52	26,3	7	3,5	2	1	240	51	9	1,9	1	0,2
	limité	271	50,4	—		—		197	46,1	9	2,1	—	
ɑ̃	libre	51	25,8	52	26,3	21	10,6	9	1,9	89	18,9	36	7,6
	limité	54	10	129	24	32	6	7	1,6	140	32,8	18	4,2
ɔ̃	libre	—		1	0,5	14	7,1	—		28	5,9	59	12,5
	limité	—		3	0,6	49	9,1	—		6	1,3	50	11,7
		Melle A.E.						Melle M.C.					

I / II		ɛ̃	%	ɑ̃	%	ɔ̃	%
ɛ̃	libre	n'a pas été testé		16	15,1	6	5,6
	limité			26	12,2	—	
ɑ̃	libre			28	26,4	18	17
	limité			28	13,1	103	48,1
ɔ̃	libre			28	26,4	10	9,4
	limité			1	0,5	56	26,1



1 2

Figures



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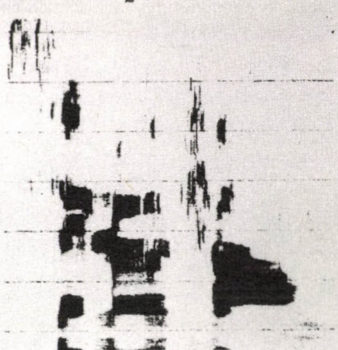

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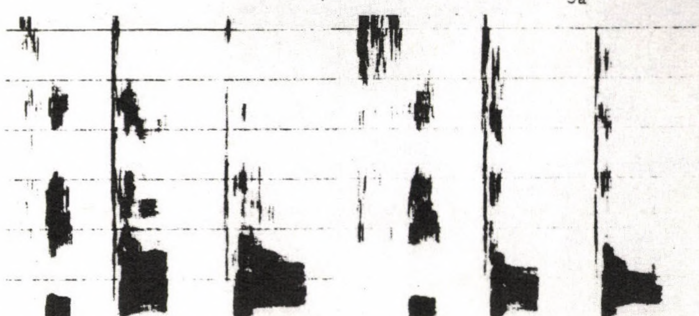

3b

ZUM KINÄSTHETISCHEN FAKTOR IM AUSSPRACHEUNTERRICHT AM BEISPIEL DEUTSCH ALS ZIELSPRACHE

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Für den Aussprachestandard, der im Deutschunterricht für Ausländer vermittelt wird, ist u.a. bemerkenswert, daß
- die rhythmisch-melodische Struktur von Äußerungen durch einen "Staccato"-Rhythmus bestimmt wird, der die gesamte Artikulationsintensität verstärkt, was sich einerseits insbesondere in der Geräuschintensität der Verschluß- und Reibelaute sowie andererseits in präziser Klangfarbe- und in spezifischer Dauergestaltung der Vokale auswirkt,
- der Intensitätskontrast bei den Verschluß- und Reibelauten sowie der relative Klangfarbeunterschied bzw. Spannungskontrast innerhalb der Vokale, der bekanntlich in bestimmter Weise mit der relativen Lautdauer korreliert ist, deutlich ausgeprägt sind.

Von den für den Konsonantismus der deutschen Sprache charakteristischen distinktiven Merkmalen ist der Intensitätsunterschied fortis - lenis obligatorisch und von den für den Vokalismus der deutschen Sprache charakteristischen Merkmalen der relativen Klang- (Qualitäts-) Unterschied eng - weit (bzw. geschlossen - offen oder gespannt - ungespannt) die wichtigste Kategorie. Da die relative Qualität in stärkerem Maße als die relative Quantität den Vokalcharakter im Deutschen bestimmt und außerdem enge Vokalphoneme verhältnismäßig gering Lautschwächungen ausgesetzt sind, wird hier von dem Qualitätsunterschied als differenzierendem Merkmal ausgegangen und der Quantitätsunterschied als eine phonetische Folge dieses phonologischen Gegensatzes angesehen.

Demnach besteht ein wesentliches Teilziel des Ausspracheunterrichts Deutsch darin, diese relevanten phonetischen Unterscheidungen intensitätsstark - intensitätsschwach, d.h. fortis - lenis sowie eng - weit, zu verdeutlichen und (gegebenenfalls) inten v zu üben. Dies ist speziell dann erforderlich, wenn in der Ausgangssprache die Stimmbeteiligungs- und die Dauer-Korrelation phonologisch relevant sind. In der Zielsprache Deutsch tendiert der Lerner dann beispielsweise dazu, die Fortis-Konsonanten mit zu geringer Artikulationsintensität und die Lenis-Konsonanten generell (positionell und koartikulatorisch "unabhängig") stimmhaft zu realisieren, so daß die obligatorische Auslautfortisierung der Verschluß- und Reibelaute und die progressive Stimmlosigkeitsassimilation aufgehoben bzw. durch regressive Stimmhaftigkeitsassimilation die auslautenden Fortis-Konsonanten lenisiert werden. Und die eng-langen Vokalphoneme werden entweder weit-lang oder weit-kurz realisiert. Hierbei handelt es sich um Aussprachevarianten, die vom Muttersprachler als auffällige Fehler empfunden werden.

Obwohl die kontroverse Diskussion zur phonologischen oder phonetischen Fundierung und Orientierung des Ausspracheunterrichts nicht belebt werden soll, halte ich - ausgehend von der Gültigkeit und Wirksamkeit des didaktischen Prinzips der Planmäßigkeit und Systematik für jeden Unterricht (8) - die Orientierung an den distinktiven Merkmalen der funktionstragenden Phonemkorrelationen für hilfreich, wenn sie den Erwerb konkreter Artikulation begründet sowie unterstützt, was für die Beschäftigung mit dieser phonetischen Substanz der Fall ist.

Neurophysiologisch und genetisch ist Sprechen ein komplexes Bewegungskontinuum, das unterbewußt kortikal gesteuert, koordiniert und kontrolliert wird. Die Artikulation (auf deren Betrachtung ich mich hier beschränke), gleichfalls eine hochdifferenzierte und komplizierte Koordinationshandlung, kann als eine sensumotorische Fertigkeit gekennzeichnet werden. Die Bewegungen der Artikulationsorgane bzw. der -muskulatur laufen weitgehend automatisiert ab, bewußtseinsentlastet bzw. dem Bewußtsein entzogen, gesteuert durch den kinästhetischen Kontrollkreis, der in spezifischer Weise mit dem auditiven korreliert ist. (Durch diese synästhetische Verknüpfung sind mit der auditiven Perzeption der Sprachsignale stets auch gewisse Qualitäten des kinästhetischen Sinnesmodus gekoppelt.) Die Artikulationsmotorik kann aber durchaus in gewissen Grenzen bewußtgemacht sowie vom Sprecher wahrgenommen werden. Und bei der Korrektur der Artikulation bzw. der Anbahnung von neuen Sprechbewegungen, in der sogenannten Aneignungsphase, können und müssen einzelne Komponenten des Sprechbewegungsablaufs (und deren akustische Effekte) einer steuernden Kontrolle durch das Bewußtsein unterworfen werden (10,11). Innerhalb der bewußt-willkürlichen multisensorischen Selbstkontrolle und -korrektur der artikulatorischen Feinmotorik spielen neben anfangs dominanten auditiven Informationen insbesondere kinästhetische eine entscheidende Rolle. Dies um so mehr, da das kinästhetische Kontrollsystem einerseits weitgehende Autonomie besitzt, so daß auch ohne auditive Rückkopplung (z.B. bei binauraler Vertäubung) hinreichend verständlich gesprochen werden kann. Und andererseits besteht zwischen kinästhetischen, auditiven und visuellen Wahrnehmungen und Bewegungskontrollen ein reger Informationstransfer und ein spezifisches funktionales Verhältnis (6). Außerdem sei an die aktive Selektionsfunktion von Aufmerksamkeit und Bewußtheit erinnert. Die aktive Aufmerksamkeit kann sowohl die Wahrnehmungen als auch die Aktion steuern. Es ist nicht nur möglich, selektive Aufmerksamkeit auf spezifische akustische Merkmale zu lenken, sondern auch auf bestimmte Organ- bzw. motorische Teilfunktionen, so daß die von den Sprechbewegungen ausgelösten propriozeptiven Empfindungen differenziert und zu spezifischen Wahrnehmungen bis zum sogenannten Muskelgefühl ("Artikulationsgefühl") sensibilisiert werden können, obwohl stets nur ein kleiner Teil der kinästhetischen Signale bewußtseinsfähig wird. Welche Mechanismen der "Trainierbarkeit" der Rezeptoren zugrunde liegen, ist allerdings ungeklärt.

Die sensorische, speziell propriozeptive Erfahrbarkeit artikulatorischer Parameter und damit die bewußt-willkürliche Artikulationskontrolle erhöht sich, je enger die Annäherung zwischen aktiven und passiven Artikulatoren ist. Sie ist bei Organkontakt am ausgeprägtesten, auch wenn der lautcharakteristische Artikulationsmodus nur kurzfristig hergestellt oder nur "durchlaufen" wird und die Artikulationsstelle lediglich diffus wahrgenommen werden kann, was hauptsächlich bei dorsal-palatalen und -velaren Artikulationen eintritt.

Das konstruktive Artikulationsprinzip der Konsonanten ist die Hemmstellenbildung der Artikulatoren, mit deren Hilfe für die Geräuschkonsonanten eine charakteristische Obstruenz (Explosions- oder Friktionsgeräusch) erzeugt wird. Die Artikulatoren gehen bei den Verschluß- und den Engebildungen an bestimmten Stellen (mit gewisser physiologischer Breite und koartikulatorischer Variationsbreite) Organkontakte oder Fastkontakte ein; es sind labiale Aktivitäten, Masseverlagerungen, koronale, apikale sowie dorsale Aktivitäten der Zunge erforderlich und entsprechende muskuläre Gegenkräfte, um die spezifische Aktivierung der Artikulatoren wieder "aufzuheben" bzw. um die Artikulationsmodi Verschluß oder Enge durch Sprengung oder Reibung zu überwinden. Objektivierbar sind in erster Linie Berührungs- und Druckempfindungen, ausgeprägt natürlich bei den Verschlußlauten, aber auch in den bilateralen Verschlüssen an den lateralen Gaumenbereichen für die sagittale mediale Rinnenbildung der Zungenoberfläche bei den Reibelauten, obwohl die lokalisatorischen Tastempfindungen am Gaumen im allgemeinen nicht intensiv sind, da die Dichte der Sensoren und somit die orale Sensitivität vom lingualen über den labialen zum palatalen Bereich abnimmt. Bezogen auf das artikulierende Organ ist in diesem Zusammenhang erwähnenswert, daß die Zunge, v.a. die Zungenspitze, über die höchste Konzentration von Sensoren, besonders von den "schnellen" propriozeptiven, kontrolliert wird und ihre sensorische Kontrolle zudem durch den Eigenkontakt, d.h. den Kontakt mit dentalen, alveolaren bzw. palatalen Bereichen, doppelt abgesichert werden kann. Daraus resultiert die gute Tastempfindlichkeit der Zunge und daß Berührungsempfindungen mit großer Sicherheit lokalisiert werden. Durch ihre kinästhetisch-motorischen und akustischen Merkmale sind die Geräuschkonsonanten insgesamt informationsreicher, "eindrucksvoller", deutlicher hörbar sowie "fühlbar", leichter erkennbar und verhältnismäßig schneller unter Bewußtseinskontrolle zu bringen als die Vokale, deren Bildungsprinzip die hemmstellenfreie Hohlraumgestaltung ist.

Kinästhetische Sensationen mit Empfindungsqualitäten treten vornehmlich bei den Fortis-Konsonanten auf, die eine besonders intensive Artikulation von ihren Lenis-Entsprechungen differenziert: stärkere muskuläre Energie und Spannung (festerer Verschluß, kleinere Enge), höherer expiratorischer Druck sowie stärkere Geräuschhaftigkeit und längere Dauer. Diese Kennzeichen machen die Fortes auch auditiv besser unterscheidbar und erkennbar, wozu ebenfalls die (positionell und sprechsituativ bedingte) Aspiration der Verschlußlaute beiträgt und was noch dadurch unterstützt wird, daß Fortis-Konsonanten in der deutschen Standardaussprache kaum gravierenden koartikulatorisch oder sprechsituativ bedingten Lautschwächungen unterliegen.

Genetisch sind Vokale orale Öffnungslaute, deren Produktion in erster Linie auditiv kontrolliert wird. Für die Vokalartikulation sind v.a. dorsal-palatale und -velare Zungenmassebewegungen (sagittal-horizontal und vertikal sowie gespannt : ungespannt) und Lippenbewegungen (labial : illabial) maßgebend. Die kinästhetischen Impressionen konzentrieren sich dementsprechend auf Lage-und Spannungsempfindungen, die besonders in der Zunge, namentlich im Postdorsum, nicht gut ausgeprägt und allgemein dem Bewußtsein relativ schwer zugänglich sind.

Die sensorische Erfahrbarkeit artikulatorischer Parameter bezieht sich demnach v.a. auf die engen bzw. gespannten Vokale, die im Vergleich zu den entsprechenden weiten mit stärkerem Spannungsgrad der gesamten Artikulationsmuskulatur gebildet werden: engere Lippenöffnung, geringerer Zahnreihenabstand und höhere Zungenaufwölbung, sowie auf die labialen Vokale. Außerdem sei erwähnt, daß die engen Vokale im Deutschen in der Regel lang gesprochen werden. Kinästhetische Impressionen mit gewissen Wahrnehmungensqualitäten treten unter den engen Vokalen folglich bei den prädorsalen Hochzungenvokalen auf, unterstützt durch den für orthoepisches und orthophonisches Deutschsprechen geforderten elastischen Kontakt des vorderen Zungenrandes mit den lingualen Flächen der unteren Frontzähne. Denn diese untere Zungenkontaktstellung begünstigt insbesondere die Horizontalverlagerung der Zungenmasse nach vorn und ihre prädorsalen Aktionen (vertikale Spannungen).

Keineswegs sollte und darf der kinästhetische Faktor isoliert, verselbständigt werden, aber er sollte im Ausspracheunterricht, bei dem es in neurophysiologischer Hinsicht um die Entwicklung neuer motorischer und sensorischer Muster geht, stärker berücksichtigt werden und mehr als nur eine Ergänzung des Übens "über das Ohr" sein, da er Sprachaufnahme und -produktion wesentlich unterstützt. Ohne die Voraussetzung des phonematischen und phonetischen Hörens im Fremdsprachenunterricht anzweifeln zu wollen, sei doch darauf hingewiesen, daß es durchaus möglich ist, ohne diskriminatives Hören ausreichend zu artikulieren und daß auditive phonetische Differenzierungsfähigkeit nicht automatisch "richtiges" Sprechen bewirkt.

Die unterbreiteten neurophysiologischen und physiologisch-genetischen Kriterien erlauben die Empfehlung, bei der Erarbeitung der für die deutsche Sprache distinktiven konsonantischen Intensitäts- und vokalischen Qualitäts-Korrelation mit der Fortis-lenis-Korrelation zu beginnen und von den Fortis-Konsonanten, besonders den Verschlußlauten auszugehen. Innerhalb der Erarbeitung der Qualitäts-Korrelation empfiehlt sich sinngemäß der Beginn mit den engen (gespannten) Vokal-Reihen, insbesondere den vorderen Hochzungenvokalen (4). Meine Empfehlung ist zwar als didaktisch-methodischer Rahmen für eine phonetische Systematik nach lautkonstitutiven Faktoren aufzufassen, stellt jedoch keine Klassifikation nach dem Schwierigkeitsgrad dar. Es handelt sich also nur um allgemeine Richtlinien zum Aufbau und Ablauf der Artikulationsschulung in Deutsch als Zielsprache, die zudem spezifische ausgangssprachliche Bezüge ausklammern mußten. Ohne auf den Charakter der Übungen und des Übungsmaterials näher eingehen zu können, sei zumindest parenthetisch ausgeführt, daß die Artikulationsschulung stets als Bestandteil eines komplexen Ausspracheunterrichts anzusehen ist, der eine intonatorisch und phonostilistisch variable Verwendung der Standardaussprache anstrebt, für die das Üben von isolierten Lauten, Silben, Logatomen sowie semantisch-syntaktisch und situativ kontextfreien Wörtern und Wortreihen wenig sinnvoll ist und dem unabdingbaren Anspruch auf kommunikative Adäquatheit nicht entspricht (5).

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BEMERKUNGEN ZUR PERZEPTION DER INTONATION

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I. Als erstes möchte ich Ihnen kurz mitteilen, was mein Interesse an diesem Thema geweckt hat. Im Unterricht an der Universität stelle ich immer wieder fest, daβ die Studenten bestimmte ungarische Dialekte — vor allem die von der Hochsprache am stärksten abweichenden Moldauer tschangonischen Dialekte — nur mit gröβter Mühe verstehen, auch wenn dies nicht durch Archaismen und Lehnwörter erschwert wird. Sobald ich aber die betreffenden Passagen gemaβ der Intonation, der Akzente und des Rhytmus der Hochsprache selber noch einmal segmentiert wiederhole, verstehen sie sie sofort. Auf diese Weise wurde mit klar, daβ das "Verstehen" der suprasegmentalen Struktur das Textversändnis in groβem Maβe beeinfluβt. Die befremdende Wirkung verursacht vermutlich in erster Linie der Gesamteindruck,den die Intonation eines gröβeren Textabschnittes erweckt, den ersten Eindruck bestimmen wahrscheinlich eher Melodie und Akzent, da sie Leichter erfaβbar sind, als das "segmentale Textverständnis", das gröβere Aufmerksamkeit erfordert. Diese Beobachtung hat mich dazu bewegt, mich mit der Perzeption suprasegmentaler Erscheinungen zu befassen. Obwohl ich im Grunde genauere Kenntnisse über den behandelten Dialekt erwerben möchte, werde ich versuchen, auch allgemeingültige Schlüsse zu ziehen, zumal der untersuchte Korpus die Grenzen des genannten Dialektes weit überschreitet.

II. Die Forschungen zum Moldauer Tschangodialekt waren bisher nur auf den Lautbestand und den Wortschatz beschrankt. Die bedeutendsten Forscher dieses Themas, Gyula Márton und Attila Szabó T., haben den Suprasegmentalien überhaupt keine Aufmerksamkeit gewidmet. Lajos Hegedűs hat von Südtschangonen, die ins Mutterland übergesiedelt sind, vor gut vierzig Jahren eine beachtliche Menge von Texten gesammelt, von denen János Bartók einige im Hinblick auf die Intonation analysiert hat.

Am stärksten ist die Assimilation bei den Nordtschangonen, die noch weiter östlich leben als die Südtschangonen und die szeklerischen Tschangonen.Ihr Zentrum und zugleich ihre gröβte Siedlung ist Szabófalva. Attila Szabó T. schreibt in einer Veröffentlichung aus dem Jahre 1962, daβ in den meisten nordtschangonischen Dörfern nur noch die Alten Ungarisch sprechen. Er nennt auβer Szabófalva noch neun weitere nordtschangonische Dörfer. Die von mir analysierten Texte stammen zum einen aus Szabófalva, zum anderen aus Ploszkucény, wo die im vorigen Jahrhundert von Norde übergesiedelten Ungarn ihren nordtschangonischen Dialekt bis heute beibehalten haben. Da es sich um einen stark verfallenen Dialekt handelt, ist anzunehmen, daβ sein Lautsystem, seine Grammatik, sein Wortschatz und nicht zuletzt seine suprasegmentale Struktur neben den Archaismen sehr viele rumänische Eigenheiten enthalten.Mit der Intonation der Tschangonischen Dialekte habe ich mich bisher nicht befaβt so daβ ich an dieser Stelle einige charakteristische Merkmale nennen muβ, die ich anhand des mir zur Verfügung stehenden

Tohnbandmaterials erarbeitet habe.

- Tempo und Rhytmus verhalten sich ander als in der Hochsprache. Das Nordtschangonische wird im allgameinen schneller gesprochen, wobei der Redefluβ allerdings von Zeit zu Zeit durch stark verlängerte Silben unterbrochen wird /was in einigen Fällen auch ein Zögern als Ausdruck sprachlicher unsicherheit sein kann!/. János Bartók hat beobachtet, daβ die Südtschangonen stockend sprechen, und dasselbe gilt auch für die Nordtschangonen.

- Die Betonung fällt oft nicht auf die erste Silbe des Wortes, z.B. eszténából, vaszárnap, usw. Zahlreiche Feststellungen Bartóks über das Südtschangonische müssen noch dahingehend untersucht werden, ob sie nicht auch für das Nordtschangonische zutreffen.

- Die typische Satzmelodie ist schwebend-steigend und dann abfallend, bei Fragen schwebend und sprunghaft ansteigend. Auch Bartók hat beobachtet, daβ die groβen Intervalle und das Ausnützen der oberen Regionen des individuellen Stimmumfangs dem Dialekt einen ureigenen Charakter verleihen. Der Übergang zwischen Kopfstimme und Bruststimme ist auch im Nordtschangonischen genau wahrnehmbar, und in Szabófalva z.B. finden sich einige ganz extreme Beispiele dafür. Vor dem Wechsel weist die Intonation oft lange schwebende Passagen auf. Der Abschluβ der einzelnen Segmente ist meist sehr intensiv, d.h. charakteristisch sind der plötzlich abfallende und der sprunghaft ansteigende Abschluβ, schrittweise fallenden oder steigenden Abschluβ dagegen hört man selten.

III. Der Tschangodialekt hat also anscheinend genug suprasegmentale Eigenschaften, die, da sie von denen der Hochsprache und der übrigen Dialekte abweichen, befremdend auf die Studenten wirken. Im folgenden möchte ich diese Merkmale untersuchen,und zwar um festzustellen, welche Faktoren das Verständnis — zumindest bei Personen mit Ungarisch als Muttersprache — am stärksten beeinflussen, welche primär und welche weniger wichtig sind, damit ein Text als "echt ungarisch" bzw. als fremdartig empfunden wird. Ist die Fremdartigkeit wahrnehmbar, wenn nur die einzelnen suprasegmentalen Elemete "anders" sind? Läβt sich die Gesamtwirkung des Textes durch die Abwandlung einer einzigen Komponente verändern? Ist man in der Lage, solche Komponenten beim Anhören eines Textes zu identifizieren und beim Namen zu nennen?

In den letzten zehn Jahren hat man auch in Ungarn begonnen, die Perzeption der Intonation zu untersuchen. Ich berufe mich hier in erster Linie auf Mária Gósys Analysen sowie auf Kálmán Bollas und Éva Földis Experimente und Ergebnisse. Ich stütze mich in meinem Untersuchungen auf ihre Forschungsergebnisse und verwende ihre Methoden.

Das wichtigste war zunächst, durch die Arbeit mit einer relativ kleinen Gruppe von Versuchspersonen festzustellen, ob die Auswahl des Textmaterials und die Umschreibung der Aufgabe angemessen waren. Deshalb habe ich das Experiment zuerst mit kurz vor dem Examen stehenden Ungarischstudenten und dann mit 17 Fremdsprachenstudenten des ersten Semesters durchgeführt.

Der erste Schritt war die Untersuchung der Satzmelodie denn von den suprasegmentalen Elementen ist dieses sowohl in

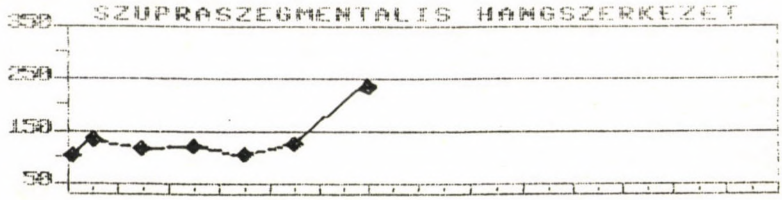
Ungarn als auch international am besten erforscht, die für das Ungarische charakteristischen Arten der Satzmelodie sind mehr oder weniger definiert, und es haben auch schon Untersuchungen zur Intonation der Dialekte stattgefunden /vgl. Csűry/, d. h. auch die Grundlagen für einen Vergleich sind im großen und ganzen gegeben.

Der Zweck dieser Teiluntersuchung war festzustellen, welche Intonationsmuster wir zum Ausdruck eines bestimmten Informationsgehaltes für angemessen halten und welche wir als fremdartig empfinden. Um dies zu erreichen, habe ich den Versuchspersonen Intonationsmuster aus verschiedenen Sprachen vorgespielt, die jeweils denselben Informationsgehalt ausdrücken.

Da der Ausgangspunkt meiner Untersuchung der nordtschangonische Dialekt ist, habe ich als erstes Beispiel eine "typisch tschangonische" Satzmelodie gewählt. Wie bekannt, ist der Betonungsablauf der Entscheidungsfrage im Ungarischen /in Sätzen mit mehr als zwei Silben/ schwebend-steigend und abfallend. Im Nordtschangonischen dagegen verlauft ihre Intonation normalerweise schwebend-sprunghaft ansteigend. Vermutlich haben sich die fremdartigen Merkmale dieses Dialektes infolge des Kontaktes mit dem Rumänischen herausgebildet. Die Moldauer /und nordsiebenbürgischen/ rumänischen Dialekte wiederum unterscheiden sich von der rumänische Hochsprache /z. B. gerade was die Häufigkeit der schwebend-sprunghaft ansteigenden und der schwebend-abfallenden Intonation betrifft/, und das Moldauische ist schon seit Jahrhunderten dem starken Einfluß des Polnischen und des Russischen bzw. des Ukrainischen ausgesetzt, so daß es sich von den übrigen rumänischen Dialekten durch seinen "slawischen Charakter" unterscheidet. Deshalb hielt ich es für nötig, außer den drei hochsprachlichen Entscheidungsfragen auch die Melodien von zwei polnischen, zwei russischen und zwei dialekten nordrumänischen Sätzen mit derselben Bedeutung miteinzubeziehen.Die zehnte Melodie war eine englische Entscheidungsfrage, und war einerseite wegen der objektiven Entfernung des Englischen zu den übrigen Sprachen, andererseits deshalb, weil die meisten Versuchspersonen Englischstudenten waren, d.h. ihnen war vermutlich auch diese Melodie nicht unbekannt.

In der Ersten Phase des Experiments hatten die Studenten, nachdem sie die per Computer produzierten Satzmelodien angehört hatten, die Aufgabe, den Betonungsablauf aufzuzeichnen und — von der ungarischen Hochsprache ausgehend — ihre Bedeutungsinhalte zu bestimmen.Als nächstes mußten sie sich — nachdem ich ihnen mitgeteilt hatte, daß alle Muster Entscheidungsfragen waren — die Melodien erneut anhören und dann feststellen, welche typisch ungarisch sind,welche eventuell aus einer anderen Sprache stammen /oder welche sich in dieser Hinsicht nicht bestimmen lassen/ und welche sicher nicht aus des Ungarischen stammen. Schließlich habe ich der siebzehnköpfigen Gruppe einen Ausschnitt aus einer tschangonischen Aufnahme vorgespielt /die andere Gruppe hatte ihn shon vorher gehört/ und gefragt, aus welcher Sprache der gehörte Text stammt.

1.

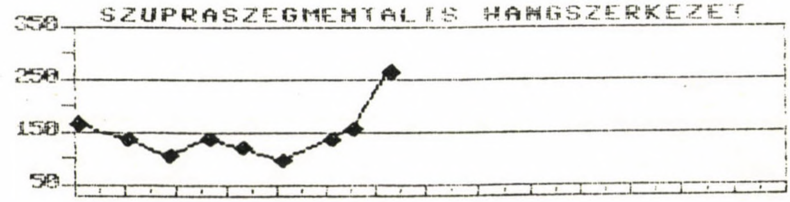


ZNASZ SIE NA TYM?

T:	0	90	280	400	680	880	1180	0	0
F:	100	125	110	115	100	120	225	0	0

TEMPO: 0 H/S HANGSZ.: 0 DB
HANGTERJ.: 125 HZ HANGKOZ: 56 %

2.

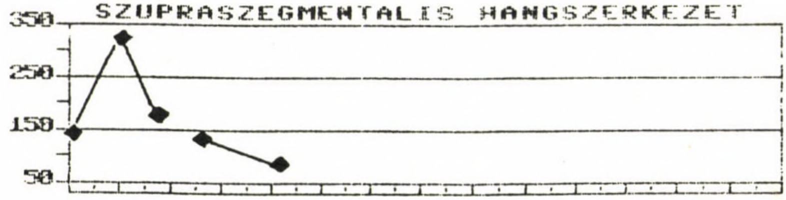


TU MIESZKA ADAM?

T:	0	200	360	520	650	810	1010	1106	1250
F:	160	130	100	130	115	90	130	150	260

TEMPO: 0 H/S HANGSZ.: 0 DB
HANGTERJ.: 170 HZ HANGKOZ: 65 %

3.

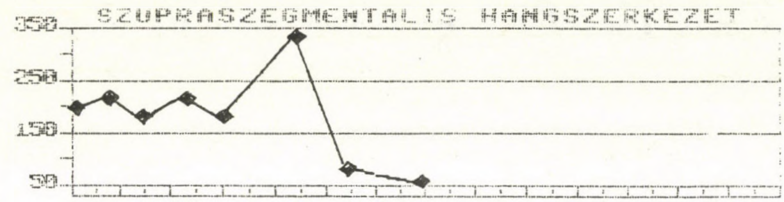


Можно ку - рить?

T:	0	200	340	340	510	510	820	0	0
F:	135	320	170	0	0	125	80	0	0

TEMPO: H/S HANGSZ.: 0 DB
HANGTERJ.: 0 HZ HANGKOZ: %

4.

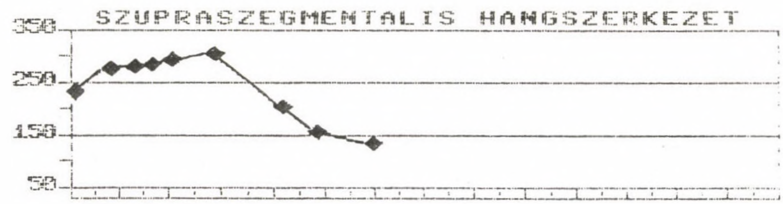


Ты не при-вёз с со-бой?

T:	0	145	280	450	590	870	1075	1375	0
F:	190	210	175	210	175	325	75	50	0

TEMPO: H/S HANGSZ.: 0 DB
HANGTERJ.: 0 HZ HANGKOZ: %

5.

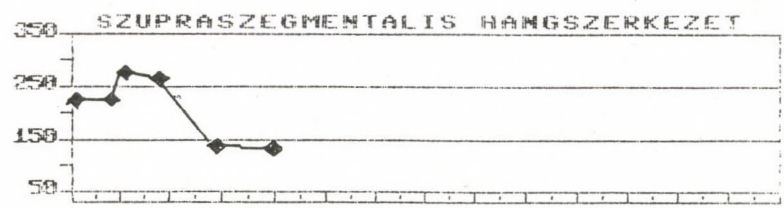


ISMERTETEK A FERJET?

T:	0	150	250	320	400	560	825	950	1190
F:	225	270	275	280	285	300	200	150	125

TEMPO: 0 H/S HANGSZ.: 0 DB
HANGTERJ.: 175 HZ HANGKOZ: 58 %

6.

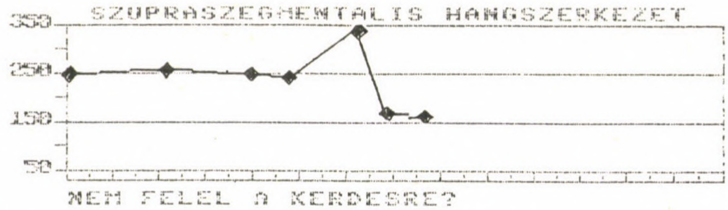


NEM KESETT?

T:	0	155	210	355	570	780	0	0	0
F:	220	220	270	260	130	125	0	0	0

TEMPO: 0 H/S HANGSZ.: 0 DB
HANGTERJ.: 145 HZ HANGKOZ: 54 %

7.



T:	0	420	720	940	1240	1380	1520	0	0
F:	244	252	244	236	332	164	156	0	0

8.

N u t e-a i t e m u t ?

9.

N o a ți v ă z u t ?

IV. Nach der Auswertung der Versuchsergebnisse läßt sich folgendes feststellen:

1. In beiden Gruppen ist die Darstellung der Satzmelodie gut, die Beurteilung der Intervalle und der Stimmlage schon weniger gelungen. Völlig falsch waren von 220 Zeichnungen nur 10, und von diesen waren 9 die Darstellungen von Fragen mit sprunghaft ansteigenden Abschluß. Die Sätze Nr. 5, 6 und 7 waren typische ungarische Entscheidungsfragen, und dies haben auch alle Versuchspersonen richtig erkannt.

2. Die Bestimmung des Bedeutingsinhaltes ist den Studenten sehr schwer gefallen. Sie sollten dabei vom Ungarischen ausgehen, wobei ich sie darauf aufmerksam gemacht hatte, daß es sich nicht unbedingt um die Melodien von wirklichen ungarischen Sätzen handelt, und doch wußten mehrere von ihnen nichts mit der Aufgabe anzufangen. Auch hier haben sie die ungarische Entscheidungsfrage am leichtesten erkannt, die polnische und die rumänische Frage mit sprunghaft ansteigendem Abschluß empfanden ungefähr genau so viele Studenten als Frage wie als Ausruf, oder eventuell als Aufforderung. Da sich diese Aufgabe als sehr schwer erwiesen hat, werde ich mich mit diesem Problem in den weiteren Phasen noch gründlicher auseinandersetzen.

3. Das Ergebnis der Frage nach der sprachlichen Zugehörigkeit ist sehr interessant und bestätigt meins vorherige Annahme. Die Studenten empfanden Satz Nr. 7 eindeutig /in der ersten Gruppe zu 100, in der zweiten zu 93%/ als ungarisch. /Nem felel a kérdésre?/, die anderen beiden zu 60-80%. Der Intonation der ungarischen Frage kommt die von Satz Nr.4 /russisch/ am nächsten, und das zeigt sich auch in den Antworten: Je 50% haben ihn als ungarisch bzw. fremdsprachig gewertet. Die Fragen mit sprunghaft antsteigendem Abschluß /Nr. 1

und 2 polnisch, Nr. 8 und 9 rumänisch/ wurden im allgemeinen als fremdsprachig empfunden, wobei 7 Studenten meinten, Nr. 1 /polnisch/ sei auch im Ungarischen akzeptabel. Der sprunghaft ansteigende Abschluß in Nr. 8 wirkte am ehesten befremdend /in der ersten Gruppe auf 100, in der zweiten auf 71%, wobei in letzterer eine Person keine Antwort gegeben hat/. Mehrere Studenten haben hinzugefügt, daß am Ende dieses Satzes, wenn er ungarisch wäre, unbedingt ein ugye oder nem /'nicht wahr'/ stehen müßte. Außer dem rumänischen Satz wurde auch die letzte, die englische, Frage von fast allen als fremdsprachig erkannt. Mehrere Englischstudenten haben mit großer Sicherheit erkannt und betont, daß es sich bestimmt nicht um einen ungarischen Satz handelt.

Die Beantwortung der letzten Frage war wider Erwarten ziemlich einheitlich. Nur zwei Versuchspersonen konnten sich für keine einzige Sprache entscheiden. Nach dreimaligem Anhören haben nur zwei Studenten erkannt, daß es sich um einem ungarischen Text handelt. Einer meinte eine finnische, ein weiterer eine italianische, Aufnahme gehört zu haben. 65%, also 11 Studenten, hielten die tschangonische Aufnahme für eine slawische, davon 7 für eine russische, und in mehreren Antworten steht: oder eine slawische Sprache. Ein Student hielt die Autnahme für slowakisch, ein anderer konnte sich nicht entscheiden und hat nur mit slawisch geantwortet.

Aus meiner Sicht ist das Ergebnis des ersten Experiments der Untersuchungsreihe gut. Es hat sich bestätigt, daß man einerseits den Betonungsablauf gehörter Sätze sehr genau perzipiert und selbst ungeübte Versuchspersonen ihn relativ gut darstellen können — auf diesem Gebiet haben die meisten Forscher ähnliche Erfahrungen gemacht — andererseits, daß die Versuchspersonen — in Kenntnis des Bedeutungsinhaltes — mit ziemlicher Sicherheit entscheiden können, welche Arten von Satzmelodien für das Ungarische charakteristisch und welche fremdartig sind. Im nächsten Schritt werden sie die Aufgabe haben, einem vorgegebenen ungarischen Satz von den ebenfalls vorgegebenen Satzmelodien die entsprechende zuzuordnen und die Antworten wieder nach typisch ungarisch und fremdartig zu unterscheiden.

Und zum Schluß komme ich auf den tschangonischen Dialekt zurück. Die eindeutige Beurteilung der Frageintonation mit sprunghaft ansteigendem Abschluß als fremdartig zeigt, daß das gesunde Sprachgefühl auch die häufig angewandte ähnliche Frageintonation im Tschangonischen nicht als typisch ungarisch akzeptieren kann. Gleichzeitig ist die Tatsache, daß in der Aufnahme nur zwei Studenten einen ungarischen Text erkannt haben, eine Bestätigung meiner früheren Erfahrungen, von denen ich hier ausgegangen war /denn in der betreffenden Passage kommt kein einziges fremdes Wortschatzelement vor/, und es gibt zu denken, daß zwei Drittel der Befragten den slawischen Charakter bemerkt haben.

Nach diesem ersten Schritt bin ich der Meinung, daß die Untersuchung fortgesetzt werden sollte, und ich hoffe, daß damit auch ich etwas zur Erweiterung der Kenntnisse über die Perzeption beitragen kann.

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AN EXPERIMENT IN THE INVESTIGATION OF THE RELATION BETWEEN ARTICULATION AND ACOUSTICS

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The artificial generation of speech sounds and continuous speech is one of the main topics of Hungarian and international phonetic research. Among the reasons why this is so we find the intention to reveal facts and the ambition to make theoretical generalizations as well as the search for possibilities of practical application. One of the decisive factors contributing to the construction of various speech synthesis systems (approximating human speech with increasing accuracy) was the application of computers in phonetic research. The first important results in the area of speech synthesis in Hungary date back to the beginning of the 1980s: these were acoustically-based formant synthesis systems for Hungarian (Voxon, Univoice) and Russian (Russon), which were suitable for the purposes of research and application. (Cf. e.g. Bolla 1982b, 1983, Kiss--Olaszy 1982 etc.)

Today, several systems are available for Hungarian and other languages, most of which involve acoustically based synthesis. (Concerning speech synthesis in Hungary, further information can be found in: Bolla 1982a, Olaszy 1989.)

It was in the 1950s that research on synthesis based on articulation, i.e. the electronic modelling of the vocal apparatus, was first started (cf. Nowakowska 1983, 9--13, who also gives an overview of the history of research). Speech simulation by means of electric circuits and electronic computers is a wide-spread method of research even today. In what follows I will review one version of articulation-based speech synthesis, implemented in the manner referred to above.

Working contacts between the Linguistics Institute of the Hungarian Academy of Sciences and the Institute of Fundamental Technological Research of the Polish Academy of Sciences were established in the 80s. Since 1986, the work is being continued at the Department of Phonetics at Eötvös Loránd University. Participants representing the Hungarian side are Kálmán Bolla and Éva Földi, whereas the Polish institute was represented in the beginning by W. Jassem, G. Demenko and later by R. Gubrynowicz, W. Mikiel, W. Nowakowska, and P. Żarnecki. One of the areas of our cooperation is speech synthesis, where the development of computer programs (software) was undertaken by our Polish colleagues and the preparation of the cineradiographic photographs needed for the computer work, including their analysis and computer printing, as well as the compilation of data base, by us.

In the laboratory of the Department of Phonetics at Eötvös Loránd University we have tried to apply -- together with the Warsaw institute -- the method of computer speech synthesis using the more than one thousand cineradiographic photographs made by Kálmán Bolla.

We have worked out a procedure for the computer examination of articulatory processes in the supraglottal tract -- which play a decisive role in speech production (cf. Bolla--Földi--Kincses MFF 15. 1986, 155--64). We have applied this method also in interlingual phonetic research, and the results attained formed the basis for the development of our synthesis program.

For articulation-based synthesis, we needed a program which was able to calculate the data of the spectrogram (i.e. frequency and intensity values and phase relations) from the articulatory (configurational) data of any cineradiogram as printed out by the computer or appearing on the screen, construct the acoustic diagram (spectrogram, waveform) of the appropriate sound, and produce the sound itself on the basis of acoustic data so obtained.

First we had to make a simulational model of the vocal tract. As it is known, the anatomical structure of the vocal apparatus is very complicated. In our model -- in accordance with the requirements of modelling -- we had to take those elements into account that are most important with respect to articulation, i.e. the respiratory organs, the larynx and the supraglottal cavities. Our method enables us to examine the sound effects connected with changes in the supraglottal tract.

In the first step W. Nowakowska worked out -- on the basis of results of earlier research on this subject (cf. e.g. Fant 1960, Kacprowski 1981 etc.) -- the simulational model of the vocal tract (Nowakowska 1983), the essential points of which are as follows.

The vocal tract (= the larynx, the pharynx, and the oral and nasal cavities) is a tube-shaped acoustic transmission system, extending from the larynx to the lips and the nostrils, respectively. The vocal tract is not a tube of costant but of changing diameter, which consists of n cylinder shaped segments of length L with various diameters. On the other hand, the structure and geometrical configuration of the nasal cavity we can take for constant in the production of oral sounds (Nowakowska 1983, 6--11).

This model, which was supplemented with the nasal cavity in a second step, is suitable for our purposes, that is, from the length and diameter values of the articulatory geometrical configuration given in cm we can deduce the acoustic projections.

The program -- devised by W. Nowakowska and P. Żarnecki -- performs the following operations after the geometrical data have been supplied (on the manner of data input see further below):

1. calculations -- from the geometrical data the program calculates the frequency and intensity values and the phase relations,
2. display of the acoustic diagram -- this shows the spectrogram and the oscillogram, so one can read the values for frequency, intensity, and phase relations,
3. vocalization,
4. changing of parameters -- one can change the fundamental frequency (F0), the frequency grid (size of steps), the frequency range (initial and final value), etc.,
5. corrections,
6. storage of the acoustic and configurational data,
7. printing, and
8. retrieval of the stored data.

The preparation of the cineradiograms for input is done in the following manner.

From five schemata of the articulation of the sound we have to choose the configuration that is most characteristic of its pure phase (about the preparation of cineradiographic materials cf. Bolla 1981, Bolla--Földi 1987, Bolla--Földi--Kincses 1986, MFF 15. 155--64). After the vocal tract has been put on the screen we divide the distance between the larynx and the lips into segments of 1 cm each, and measure their radiuses (R) in cm (cf. fig. 1). There exists a version of the program that makes it possible to have segments of varying length (and not the constant 1 cm). If the sound in question is nasal or nasalized we can give the data of the segments of the nasal cavity -- whose number is constant, namely 12 -- based on measurements and partly on experience.

The program needs for the calculation the following data of configuration:

-- the number of segments (= the length of the vocal tract) here we also have to give whether the segments in question are of constant (1 cm) or of varying length; the same applies to the nasal cavity,

-- the data of the radius of each segment.

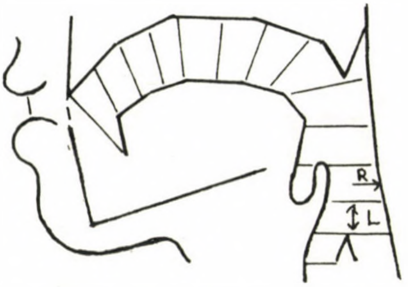

Fig. 1. A schematic cineradiogram (L = length, R = radius)

When the input data have been recorded we are able to print the geometrical shape of the supraglottal cavities.

Before the calculations the program asks which acoustic diagram we want to examine. There are three possibilities to choose from: 1. only the pharynx and the oral cavity, 2. only the nasal cavity, 3. it is possible to represent all three spectrograms derived from the configurations of the cavities. In the latter case what we get is a summarized curve for frequency and intensity. The program enables us to depict the frequency structure between 50--5000 Hz and we can get intensity values between 0--40 dB. The frequency range can be changed at will, i.e. it can be narrowed down if it is only a certain section that we want to examine; in that case what we get on the screen is the enlarged picture of the chosen section.

Before vocalization the program asks for the address of the AD/DA converter, and the calibration data of the vocalization (e.g. the number and intensity of the periods that we want to vocalize, etc.). If we want to improve on the quality, that can be done by changing the configurational data.

Based on the data (frequency and intensity values) of the spectrograms attained from the simulational model we have also produced the sound with an acoustically-based synthesizing system working on the principle of formant synthesis (Voxton), which was designed for a Commodore 64 personal computer and MEA 8000 chip-synthesizer, and later from IBM PC compatible computer. Given our precise knowledge about the acoustic structure we could then compare the sounds produced by the two methods of synthesis. As the physiological data were originally derived from video recordings, we were also able to compare the subjective sensual impression of the synthesized versions and their spectrographic representations with those of the natural pronunciation. So we get the possibility of reliable control and many-sided comparisons for scientific research.

At its present state the articulation-based program can do the synthesis of oral and nasal or nasalized vowels, and vocalic glides.

Through articulation-based synthesis we can simultaneously examine the geometrical configuration of the supraglottal cavities and the acoustic structure of the sound. The figures below contain the diagrams of a number of sounds produced by this method. On the diagrams one can see the geometrical configuration of the supraglottal cavities, the oscillogram and the spectrogram, and further the frequency and intensity values as well as phase relations. The spectrograms depict the summary curve (the one derived from the configuration of the pharynx, and the oral and the nasal cavities).

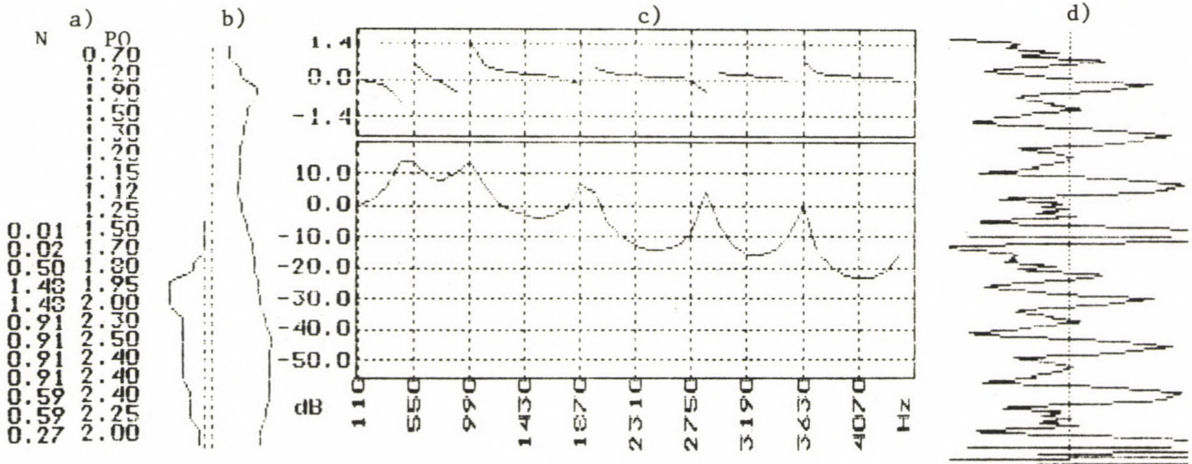

Fig. 2.
The diagram of the vowel [a:]

a) the radiuses of the segments (O = the nasal cavity, PO = the pharynx and the oral cavity)
b) the geometrical shape of the supraglottal cavities
c) the spectrogram of the sound
d) the oscillogram of the sound

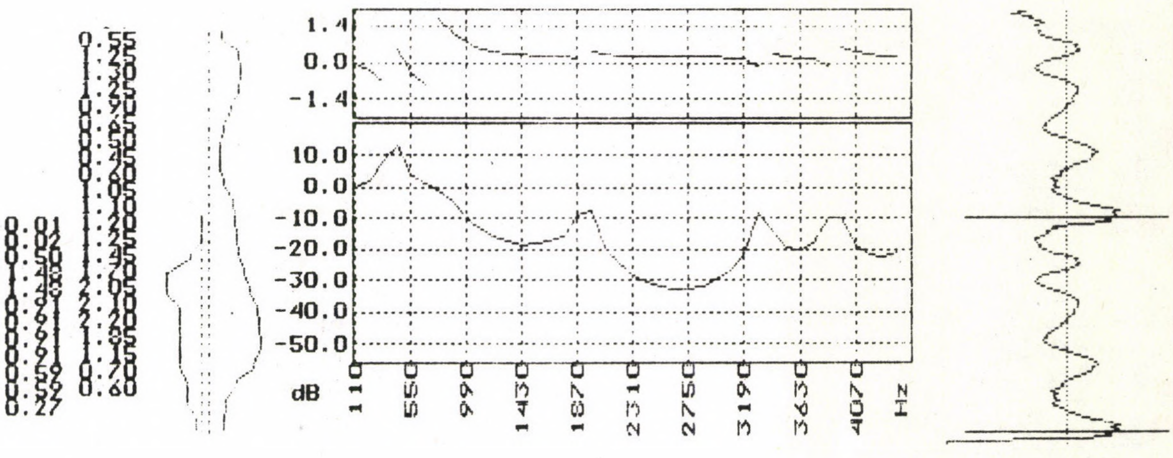

Fig. 3.
The diagram of the vowel [o]

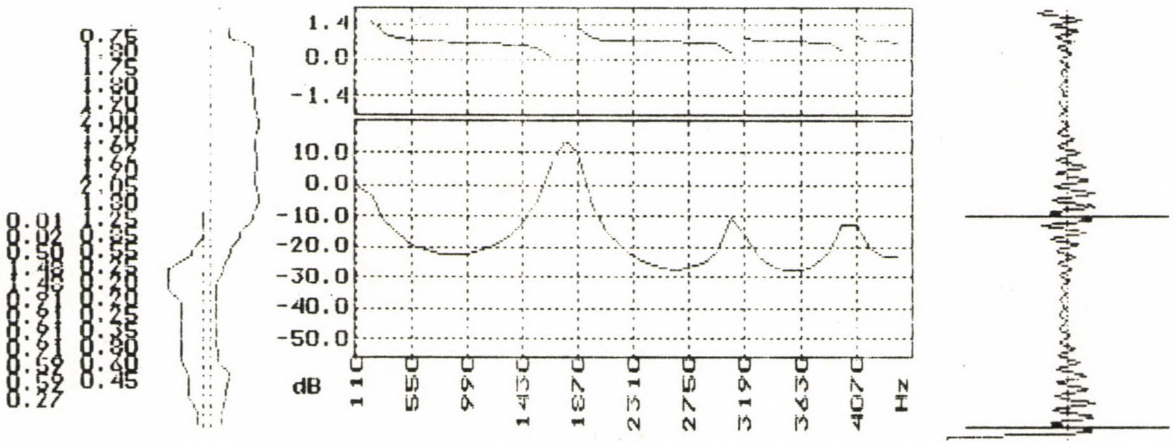

Fig. 4.
The diagram of the vowel [i:]

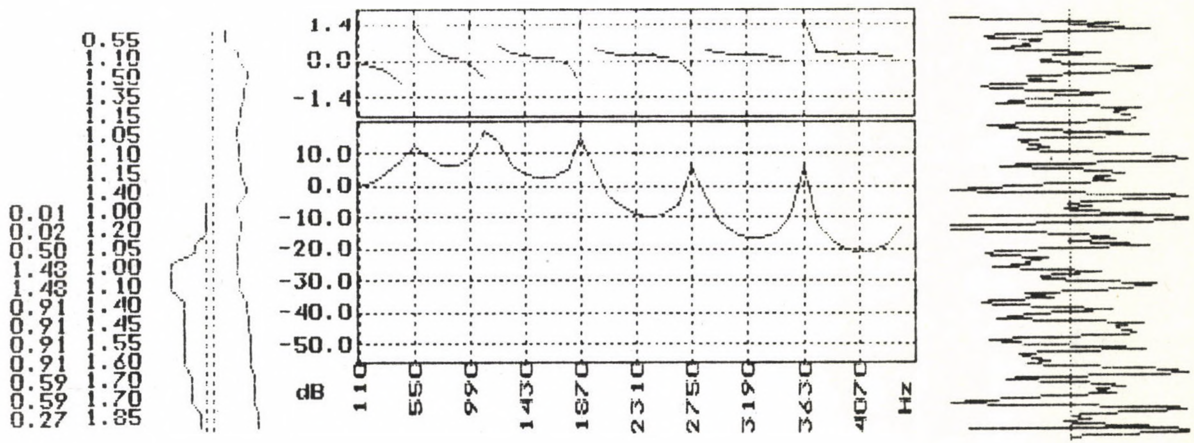

Fig. 5.
The diagram of the vowel [ε]

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PERCEPTUAL CUES TO INTONATION

A peak-shift experiment with some Swedish prosodic phrase patterns

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Introduction

The paper reports on one of a series of experiments which all aim at finding perceptual correlates of intonation. The chosen phrase patterns exemplify various syntactic and semantic structures which may be controlled by intonation and the experiment uses a technique in which an Fo peak of a constant triangular shape in digitized natural speech has been shifted in steps of 20 msec by means of the ILS program. In this way a number of stimuli could be generated which have been tested.

The method of shifting the time location of a pitch peak in synthetic speech to study the effect on listeners is not unusual. Typically the aim has been to determine boundaries between distinctive prosodic categories, e.g. Accent 1 and Accent 2 in a southern Swedish dialect (Malmberg 1955), Serbo-Croation accents (Purcell 1976), sentence accent in American English (Gårding & Gerstman 1960) accents with different pragmatic values (Kohler 1987).

We shall use the same method. Our main concern is the perceptual aspects of such a shift. More precisely we ask the question, for a certain phrase contour, what are the perceptually relevant combinations of pitch movement and segment?

Material and method

Some segmentally equivalent but prosodically and semantically different sentences were elicited in declarative intonation from a trained phonetician representing a modified Stockholm dialect (Table 1). The recorded sentences were analysed digitally and manipulated by means of the ILS program. As a first step two prototypes were chosen from the several productions of each sentence (Table 1) and their Fo patterns were simplified by using straight interpolation between conspicuous turning points.

The peak-shift experiment was conducted with two of these simplified contours, superposed on two spectral carriers, one derived from prototype (a) ending in accented /mɛn:/, the other from prototype (b) ending in deaccented /mɛn:/. For the experiment a new computer program was designed. As can be seen in Figure 1, the first peak over the syllable /lɔŋ:/ has been kept fixed, the second peak has been shifted in steps of 20 milliseconds towards the end of the sentence. In this way we could obtain two series of stimuli which apart from the intended categories (a) and (b) also turned out to include a third, a compound phrase (c).

In the subsequent tests there were altogether 3*40 = 120 stimuli which were judged by two groups of sixteen listeners each from Lund and Stockholm. The listeners, members of the linguistics departments, heard the stimuli over loudspeakers in the perception lab of their respective department. They were asked to place each item heard in one of the three categories (a), (b) or (c), as shown in Table 1.

Results and discussion

With the carrier derived from prototype (a) (Fig.1a) there is a sharp cross-over region between stimuli 15 and 18, i.e. at the end of /m/. Before the cross-over the compound is given about 15% of the votes and after this point about 70%. The response functions for the two-word phrases follow each other rather closely with some but much less than expected dominance for the accented /mɛn:/ responses. The carrier from the deaccented /mɛn:/ phrase, prototype (b), (Fig.1b) has a similarly located cross-over with regard to segments (at the end of /m/). Here the votes for the deaccented pattern are predominant over the accented one. The compound phrase is well accepted after the cross-over also in this carrier.

The difference in scores, obtained with similarly contoured stimuli in the two carriers, notably the compound, suggests that intensity, temporal and spectral characteristics play a not insignificant role in the identification of a prosodic phrase pattern.

The contours with the highest scores for both carriers are displayed in Figure 2. They show that the three prosodic patterns can be given carrier-independent descriptions. Note, however, that the two-word contour with accented /mɛn/ with carrier (b) which only received 22% of the votes has been disregarded.

Carrier-independent description:

Two-word phrases		over /a/	over /ɛ/
accented	/mɛn:/	rise	fall
deaccented	/mɛn:/	fall	low
Compound		low	fall

The compound seems to have a special status among listeners as compared to the two-word phrases which are not easily kept apart. (A group of fluent Swedish speaking non-native listeners have difficulties with the compound, however.) Reactions from the listeners make us speculate that the compound is separated from the other two by a simple binary choice between compound vs. non-compound, here materialized as low /a/ vs. non-low /a/. This choice precedes whatever choice has to separate the other two.

The common carrier-independent description supports the hypothesis that the pitch movements over the vowels are prime perceptual cues to a prosodic pattern. (In analyses of Chinese and Swedish the tone (accent) carrying part of the syllable is the sonorant segments, the rhyme (Howie 1976, House et al 1988). The hypothesis may explain the low percentage of the accented pattern in the (b) carrier. Due to the narrow base of the pitch peak no stimulus in this series has the prototypical movements over the vowels.

Conclusion

Our results lead to the tentative conclusion that for a prosodic phrase pattern to be easily recognized it is important that the spectral, intensity and temporal pattern fit the prototype and that Fo has the prototypical movements over neighbouring vowels. A mechanical shift of the pitch peak reveals that it is when the pitch peak has produced such patterns that the identification with a given pattern is the best. An Fo peak per se is perceptually unimportant. It is the adjoining ramps over vowels which have perceptual reality.

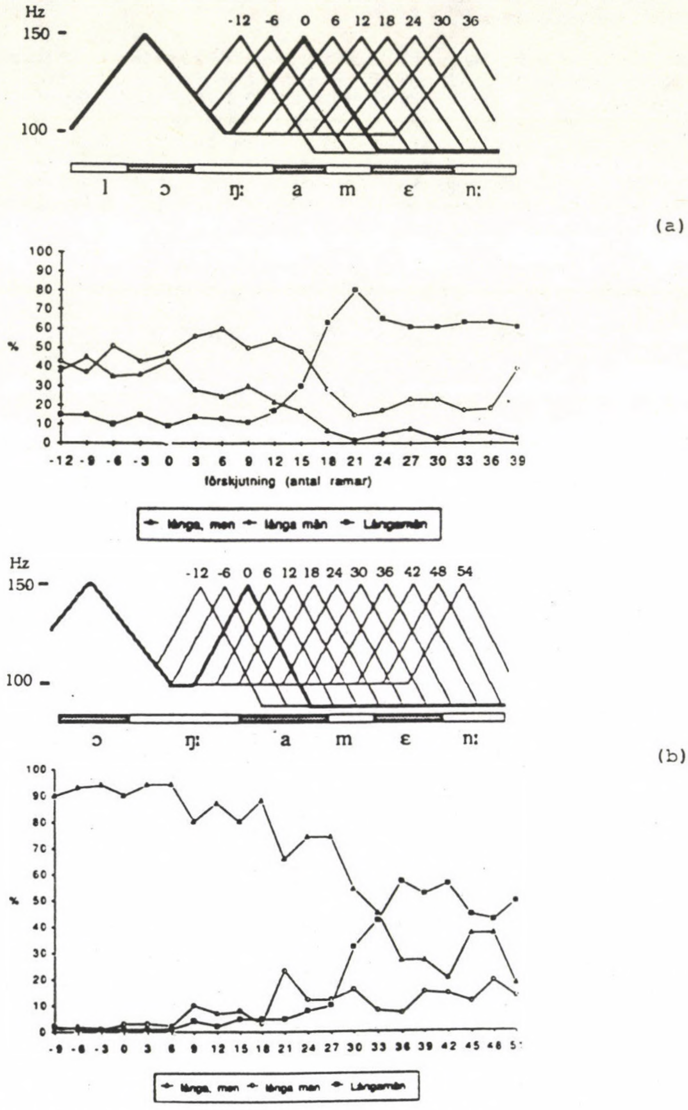


Fig.1. Stimuli with shifted peak and response functions

a) Carrier with accented /mɛnː/

b) Carrier with deaccented /mɛnː/

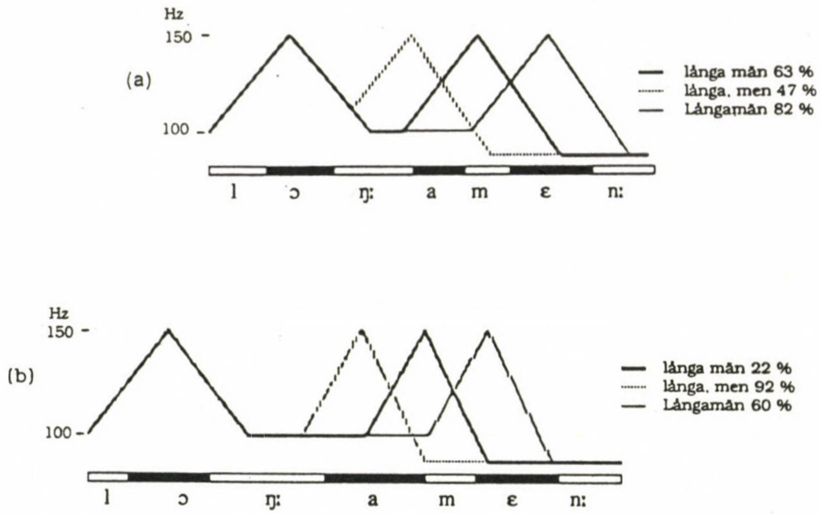
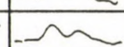
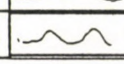


Fig.2. Contours with highest scores. (a) Carrier with accented /mɛn:/ . (b) Carrier with deaccented /mɛn:/ .

Table 1. The prototypes

	Written form	Syntax	Meaning	Phonetic form	Accent pattern	F0 contour
a	långa mån	2-word phrase	tall men tall <u>men</u>	\`lɔŋ:a + ´mɛn:	accented, unacc, accented	
b	långa mån långa, men	2-word phrase	<u>tall</u> men tall but	\`lɔŋ:a + ˌmɛn:	accented, unacc, deaccented	
c	Långamån	compound	men from Långa	\`lɔŋ:a´mɛn:	accented, unacc, accented	

The accents which are irrelevant to our study are marked ´ for A1 and \` for A2 , ˌ for deaccented, + for juncture. The examples are borrowed from Bruce. For other speakers see Bruce 1977.

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ON THE PREDICTABILITY OF READING PERFORMANCE

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During the past few years an increasing number of children have been judged "dyslexics" because of their reading and writing difficulties, in Hungary as well as in many other countries all over the world. The basic problem of Rudolf Flesch's two books ("Why Johnny can't read", 1955 and "Why Johnny still can't read", 1966) seems to be just as timely as it was when they were written. There are many Johnnys who are not actually dyslexic children; however, they produce very similar errors and behaviour to those who are. The number of Johnnys - who still cannot read and, as a consequence, never read - is on the increase in every country despite the newer and newer methods involved in teaching. The proportion of pupils called 'poor readers' is rather high in almost all Hungarian primary schools. This claim is - unfortunately - supported by data taken from several investigations (cf. Adamikné Jászó 1989). According to an observation made in 1967, 1.29% of the pupils in thirty examined Hungarian primary schools were afflicted with reading disorders (Ligeti 1967). A similar situation can also be found in other European countries. For example, the ratio of dyslexia appears to be 4.0% in Austria, 2.5% in Denmark, and 1-to-2% in Sweden. The expected, "good" reading level of children suggests an even worse state of affairs: an investigation in Britain revealed that 20% of the 11-year-olds were not able to read a single sentence and, in Hungary, 40% of the pupils of two ordinary seventh-grade classes had reading difficulties (Laczkó 1988).

Experts of the problem of reading and dyslexia claim that any component of the language faculty - i.e. any of the several autonomous subsystems: phonology, syntax, or semantics - might be the source of reading difficulties (Biglmaier 1964; Shankweiler--Crain 1986). The language system, together with a processing system and a working memory, constitute the relevant cognitive apparatus. These authors' results with poor readers and dyslexics highlighted the areas where they had a inadequate performance:

poor conscious access to sublexical segmentation and poorly developed metalinguistic abilities for manipulation of segments,

difficulties in naming objects,

special limitations in phonetic perception,

deficiences in verbal working memory (limited to the language domain),

difficulties in understanding spoken sentences.

As a conclusion, it has been suggested that these deficits clearly tend to co-occur (though not necessarily all), however, poor performance in terms of speech perception and understanding can always be found with poor readers (Shankweiler--Crain 1986, 176-178). Another aspect of linguistic behaviour, the level of mastering language skills also clearly impinges on reading ability. The majority of dyslexic children were found delayed in the acquisition of spoken language (Richardson 1983). Three syndromes for dyslexia were differentiated: (i) language disorder syndrome, (ii) articulatory and grapho-motor disorder syndrome, and (iii) visual-perceptual disorders (Richardson

1983, 75). Phonetic speech perception deficits were found with American dyslexic children who had problems in the identification of places of articulation of stops and the quality of vowels. The authors' conclusion that the deficiency was, in fact, not auditory but a perceptual problem suggesting genetic transmission (Lieberman--Mekill--Chatillon--Shupack 1985). Speech perception itself is based on special brain working through transmission procedures beginning with decoding the acoustic patterns of the speech wave. Cerebral dominance seems also to be a factor contributing to correct linguistic operations. Although the exact age at which cerebral dominance (in other words: the right-ear-advantage) is formed is a debated issue and might depend upon the language the children use, the "lack" of dominance or a right-hemisphere dominance (left-ear-advantage) should entail an unusual form of operation for language. It is likely that mixed handers might have deviations also in their language processing with regard to that of clearly right or left handers. The difference between right or left vs. the mixed handers is that the latters' two hemispheres are equally involved in linguistic behaviour (Lebrun 1983). If we accept the data concerning laterality that, for example, right-handed adults tend to shift their gaze to the right while solving verbal problems, and left handers do the same (Studdert-Kennedy 1985, 58), the question arises: which direction do mixed handers prefer? Would this kind of hemispheric determination be involved in the acquisition of reading? Could it be held responsible for the frequent metatheses in dyslexic children's speech, for some of their perceptual problems, and for their disturbed directions? There is no certain answer at the moment, though various experiments are in progress (cf., e.g., Sawyer 1987).

Summarizing our present knowledge on dyslexia as a syndrome, one point that should be emphasized is the close correlation that obtains between the speech perception and understanding processes and reading ability. This means that the diagnosti aspects of reading difficulties should also cover all of those patterns which are involved in speech perception and understanding of the mother tongue. "Diagnosis" - in my opinion - refers here to a complex decision about the language ability of the child in order to assess his/her reading ability. If the decision is correct, it contains also the assumed reason for (i) the reading difficulty (if in fact there is one) or (ii) the predicted reading difficulty (for kindergarten children). Because of the co-occurrence of several types of failure children exhibit while reading, the basic problem underlying poor reading performance or real dyslexia might be hidden or not quite clearly differentiated from concomitant phenomena.

Consider a wide scale of reading ability where the leftmost point corresponds to the level of extremely dyslexic children and the rightmost point is the level of 'good readers' (both technically and mentally good ones), cf. Figure 1.

```
X  •  •  •  •  •  •  0  •  •  •  •  •  •  X
   -  -  -  -  -  -     +  +  +  +  +  +
dyslexics                        good readers
```

Figure 1
Hypothetical scale for reading ability

However, between these two points there are several others which represent different levels of reading ability. Behind these levels, there are various factors which are responsible for a given level of performance in reading. These factors are: age of beginning to read, sex, intelligence, personality, family background, visual performance, language ability (particularly speech perception and understanding level), and the language-dependent teaching method. The role of the teaching method is especially important, because it may override the other factors to some extent: an inferior method may decrease the reading performance (and success) of a possible good reader and, on the contrary, a good method can help the child to reach an acceptable level in reading performance despite his poorer abilities.

On the basis of our previous investigations and experiments, it is obvious that there is a very close correlation between the speech perception and understanding level of children and that of their reading ability. It is only the speech perception process that is always disturbed in the case of real dyslexics. The same kind of disturbance is always present with children having reading difficulties as well. I am convinced that many, in fact almost all, children who are to become poor readers can be spotted before they start learning to read and write. Hypothetically I would claim: reading performance can be predicted.

At the Phonetics Laboratory in Budapest a special test-package (GMP) has been set up in order to detect children's ability for actual reading and for future reading acquisition (Gósy 1989a). In compiling the test-package, efforts have also been made to obtain information on the operations of each hypothetical level of the speech perception process quasi-separately, i.e. to detect which (if any) of the decisions the understanding mechanism has to perfom are mistaken or incorrect.

The GMP test-package consists of 15 subtests; their speech material varies from isolated words through sentences up to a longer text. These speech materials have been manipulated by various methods (such as masking by white noise, speeding up, and frequency filtration). Natural Hungarian speech announced by a trained male speaker and also artificially generated synthesized speech have been used for the subtests. Some of the listening tests have been administered to the subjects through headphones, others through a loudspeaker in a silent room. The subtests meant to measure both peripheral and central hearing, acoustic, phonetic, phonological levels of speech perception, visual and verbal short-term memory performance, lip-reading ability (i.e.visual perception), handedness, directions, repetition ability of speech rhythm, word-completion skill, and text-comprehension.

350 normal hearing, 50 hearing-impaired, and 100 possibly dyslexic children, i.e. poor readers (ages between 4 and 12) have been examined with the test-package in order to define age-specific values for normal performance (see Gósy 1989c). The child can be characterized by values expressed in numbers (Figure 2) and also by judgements expressed verbally, like "normal", "acceptable", "poor" etc. Such labels were employed e.g. for judgements as to what performance the child shows in repeating rhythmic Hungarian sentences or whether he has correct directions or not.

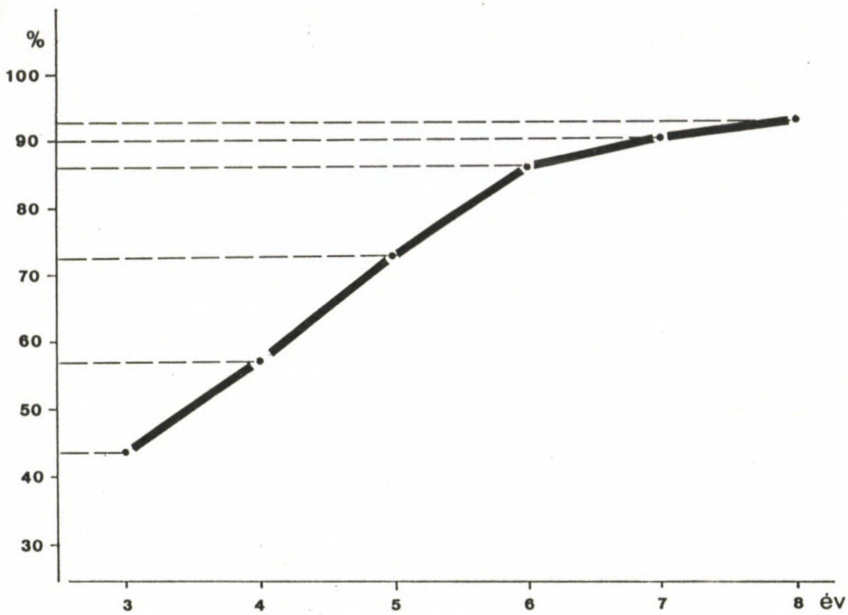

Figure 2
Performance of children examined with the GMP test-package

On the basis of previous results (Gósy 1989b) with normal-hearing children, a special diagram of speech perception development has been set up, in terms of which the perception performance of the possibly dyslexic children could be compared in "objectiv" terms with that of normal-hearing ones (Figure 3). The actual diagram of the examined child can be clearly drawn and easily compared.

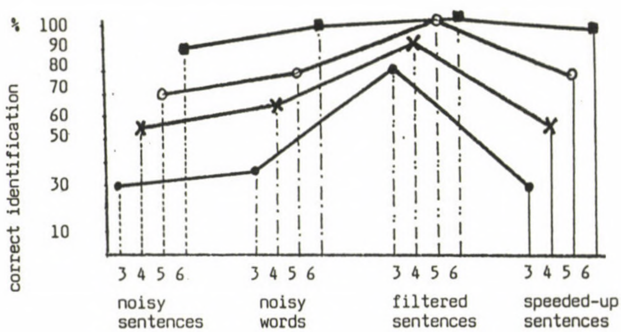

Figure 3
Speech perception performance of children
(■----■: 6-year-olds, o----o : 5-year-olds, x----x : 4-year-olds,
●----● : 3-year-olds)

An examination with the GMP test-package take about 30 minutes, either the (kindergarten/school) teachers or the speech therapists can use it easily. The final decision - based on the data obtained - refers also to some special corrective courses or therapy the child has to undergo. In Table 1 we summarized the data of an 8-year-old child who had been sent to the Phonetics Laboratory because of her poor performance in reading at the end of her first school-year. The first examination showed a surprising depressing picture concerning her language ability. Her speech perception level was roughly the same as that of a normally developed four-year-old. She fell short of expectations with respect to her working short-term memory (both verbal and visual), as well as her activated vocabulary. Her speech comprehension was vague when listening to the tape-recorded story: she seemed to figure out the sentences and the whole text due to her good logic and imagination which helped her complete the insufficient perceptual data she obtained. Regarding her good performance in the perception of speeded-up sentences and poor speech production in the imitation of nonsense sequences, a special home therapy (including a reinforcement of right-handedness and directions in general) has been proposed to the parents. The "diagnosis", i.e. the final decision on the reason of her reading difficulty seemed to be clear: delayed speech acquisition and mixed directions together with her poor articulation (concerning some consonants). The child repeated the first class in the school, and after one year she was re-examined (cf. data in Table 1). These results seem to confirm two points: (i) the decision made by the test-package was correct including both the reason defined and the proposed therapy, and (ii) the data of the second examination clearly revealed the impairment of the child's language ability as well as her reading, which also confirms the correct working of the test-package used.

Table 1

Subtests of the test-package	Results of an 8-year-old child (%) first examination	second examination
global perception (G-O-H)	55	90
noisy sentences	50	80
noisy words	60	90
filtered sentences	90	100
speeded-up sentences	100	100
lipreading	30	40
visual memory	4 items out of 12	5 items out of 12
verbal memory	3 items out of 12	5 items out of 12
order of recalled items	disturbed	normal
word detection	2 words	5 words
handedness	mixed, vague	tends to be right
nonsense sequences	70	90
comprehension of text	70	90
reading	very poor	good
reading understanding	30	70

Analysing the results of examinations carried out with the children who had reading difficulties, we tried to define the reasons for such difficulties. These reasons include the criteria characteristic of "pseudo-dyslexia". We found that pseudo-dyslexia can be caused by the following reasons:

- poor speech perception/understanding process
- mixed handedness; no dominant hand, sometimes left ear advantage
- hidden left handedness, disturbed directions
- central hearing problems
- delayed speech acquisition
- hearing loss
- teaching method problems together with an unhelpful family background
- mental problems.

The order of listing suggests also the frequency of occurrence of the main reasons, though they often co-occur (as it was pointed out above). Defining the actual reason(s) for poor reading helps the examiner to plan the corrective excercises.

A tracking experiment has been carried out to support the predictability of somebody being a poor reader. 37 first-graders (21 girls and 16 boys) participated in this experiment. They learned in the same school but in two separate classes, and their sociological background was also very similar. The children have been examined by the GMP test-package at the beginning of their first school-year and they have been reexamined after 4 months. During this time they were taught by the same teaching method, books etc. By the end of this 4-month period the children had to know all Hungarian letters (both in reading and writing) and had to be able to read simple sentences correctly. At the end of this period, the same Reading Assesment Test (RAT) has been carried out with the children in order to know their reading level. Table 2 contains the children's results obtained by the GMP test-package at the beginning of the school-year and after 4 months.

Table 2

GMP-subtests	Children's performance in %			
	Class A		Class B	
(experiments)	1st	2nd	1st	2nd
lip-reading	40	50	28	3o
word-completion	3.8 items	4.5 items	3.6 items	4.0 items
visual memory	5.6 items	5.6 items	5.6 items	5.6 items
verbal memory	4.7 items	4.7 items	4.5 items	4.5 items
nonsense words	84.1	95	86	90
speeded-up sentences	71.2	90	65.3	70
noisy sentences	88.2	96	86.5	93
noisy words	88.8	96	83.4	90
filtered sentences	100	100	100	100
natural sentences	100	100	100	100
text-comprehension	60	75	53.5	70
Average	77.3	85	73.97	78.4

15 children (7 from Class A and 8 from Class B) have been found pronouncing metatheses while repeating the meaningless sound sequences, and 18 children (8 from Class A and 10 from Class B) suffering with direction disturbances. There were 11 children (5 from Class A and 6 from Class B) who had both problems: metatheses and disturbed

directions. 4 children could not correctly repeat rhythmic sentences. 5 boys and 3 girls of a total of 37 had articulation problems (mostly mispronunciation of sibilants). The majority of children were right-handers: 21 of the two classes, while 8 (5 from Class A and 3 from Class B) were left-handers and another 8 children had no dominant hand (6 of them used their right hands for drawing and eating).

The children's data show various co-occurrences of problems as shown by the GMP-subtests, such as a mixed-hander pronouncing metatheses, having problems in identifying the speeded-up sentences, or a right-hander with no articulation problem, normal speech perception performance but poor verbal short-term memory and poor text-comprehension. Which of these co-occurrences can significantly predict the poor reading performance? Our basic hypothesis is that those children should be judged as possible poor readers who (i) show a poorer performance in (almost) every subtest of the GMP than it is required for their age level, (ii) have poorer perfomance in more than two subtests, and (iii) have an extremely poor performance in one of the subtests.

For the sake of the experiment, the children's GMP results were disclosed only to one of the two teachers, the one who taught in Class A. Moreover, some corrective excercises were proposed to this teacher to be used in the classroom in order to: (i) stabilize the children's directions and hand dominance (where this was necessary), (ii) improve their speech performance and general language skill, and (iii) extend their own vocabulary using phonics. The results of the re-examination 4 months later confirmed the usefulness of these corrective excercises in teaching reading. The children's performance in a Reading Assessment Test at the end of the 4-month period supported our hypothesis referred to above. Table 3 shows the data of the Reading Assessment Test. This test contains 6 subtests: a letter identification task, word reading controlled by pictures, words containing a missing letter, isolated sentence understanding controlled by a drawing task, reading text comprehension controlled by questions for words and sentences. The maximum score was 100 points.

Table 3

Classes		Average performance in	
	GMP	reading Test	understanding of reading
A	77.33%	97.41 points	93.5 points
B	73.97%	87.5 points	79.2 points

The children's performance with the GMP test-package shows no significant difference between the two classes, while their reading performance does ($p < 0.5$). The results are significantly better in class A where the special corrective course was performed. Data obtained in subtests for understanding of reading show a larger difference between the two classes ($p < 0.1$). The distribution of children in terms of RAT performance shows greater diversity in Class B where no corrective course was conducted than in Class A (Table 4).

Table 4

Points	Children according to RAT results (%)	
	Class A	Class B
100	53.1	35
95-99	29.5	10
90-94	17.4	25
85-89	-	5
80-84	-	10
75-79	-	5
70-74	-	10

Two relevant conclusions can be briefly drawn.

1. Speech perception and comprehension performance shows a very close interaction with reading ability. It is not only the operations at the hypothetical levels of the speech understanding mechanism that should be taken into consideration, but also the concomitant abilities and capabilities of children. There is a high correlation between their performance in these tasks and their reading performance.

2. Reading ability can be assessed before the children begin to learn reading and writing, i.e. reading performance is predictable. The majority of children's problems in relation of language and particularly speech perception should be compensated for in a preschool age. This offers a good prognosis for successful reading acquisition.

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SPEECH PERCEPTION UNDER NOISY CONDITIONS

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The most important function of hearing is the understanding of speech in the actual environmental noise condition.

In routine audiological examinations usually only the pure tone threshold is checked in silence, sometimes supplemented with suprathreshold tests. These give important data about function of the middle and inner ear, but the speech understanding cannot be judged correctly. Speech audiometry is usually made in the camera silenta (quiet room) with correctly pronounced spondees or phonetically balanced monosyllables. In some languages, however, there are no true spondees, so both in Hungarian and in German languages two-digit num bers are used.

All these speech-audiometric methods give reliable data about speech perception in ideal conditions.

Data got from the above mention ed tests, however, are not suitable enough to predict the speech perception in real environmental or industrial noise conditions.

The hearing threshold of the human ear is not linear, it cannot be measured in linear position of a sound level meter, but it equals well with the data got through the A weighted filter.

The percent of correct perception depends mostly on the sound/noise ratio, at least in the most important frequencies. Usually with S/N -5 dB the perception of sentences is over 60 %, this means, that the speech can be followed correctly.

In nearly quiet surrounding the usual speech intensity with a distance of 2 meters is about 55 dB.

When the noise level gets higher, for example a truck or a motorbike passes, or an underground train comes into the station, spech intensity should be elevated, but it can reach only about 65-70 dB. If the noise level is higher, either the interpersonal distance should be decreased, or the speech level should be greater, to ensure the speech perception.

Nobody can speak, however, above 75 dB intensity so either an electronical amplifier should be used, or instead of speaking shouting is needed.

Speech, fortified with a very good amplifier can be fairly well understood; in practice, however, there are very often great distortions, and even great reverberation is sometimes present (e.g. railway stations, factory halls) and these results decrease the correct perception.

Most people think that shouted speech is quite similar to the normal one, it is only louder.

In practice, however, shouted speech is very different in many respects:

1. only the vowels can be strenghtened, consonants cannot, so shouted speech practically consists only of vowels, and this results much more mistakes in perception.
2. Words in shouted speech are longer, for the vowels are streched, but even their length is different, the consonants, however, cannot be streched.
3. The amplitude differences are greater than usually (vowels versus consonants).
4. Shouted speech, especially the vowels are tuned with a higher frequency. This can be one of the factors which make perception more difficult at workers with high tone loss.

5. By shouting the vocal cords do not vibrate smoothly, but spactically, and this makes the shouted speech more rough, and even the secondary resonators (e.g. pharynx, mouth, nose) cannot help smoothen it.
6. Shouting is very tiring, and in a relative short time the vocal cords get exhausted and even the intensity of speech diminishes. Very often dysphonis with its phonetical, physiological and ananomical changes in the larynx can occur.

There is a very great difference between speech perception in steady state noise, in noises with varying intensities and with the impulse type one.

In the practically steady noise (e.g. weaver mill, underground train, heavy traffic on a main road) the speaker elevates his speech intensity to the level about which he thinks it is enough to understand his speech, or listens to the radio or Tv with a comfortable intensity level. Even in these cases the distance between the speaker, the listener and the noise source is very important.

In varying noise (e. g. flying over an aeroplan, or passing by a motorbike or heavy truck, noise of children) the speaker can raise his voice, but in many cases he cannot change the intensity of a Tv or radio, so in the later cases the speech perception diminishes rapidly.

The situation is quite different in case of impulse noises (e.g. shooting, hammer strokes). Our ear and brain can complete those short speech periodes which are masked by the short impulses.

The situation is more severe when the listener is hard of hearing, especially when he has a high tone loss, and his brain functions are already decreased.

A special problem concerning speech perception in industry is which noise levels make the wearing of hearing protectors compulsory.

In steady noise (e.g. weaver mill) worker cannot speak, but shout. If intensity level is over the noise level, and in this case a normal hearing worker understands the message quite well, but with a high tone loss perception decreases rapidly.

When the sourranding noise level is low, but there are high noise peaks (e.g. shooting, hammer, strokes) the usual speech intensity is low, for the workers use the relatively silent periods between the noise peaks to convers with each other, and these peaks do not disturb speech perception, the use of hearing protectors makes things worse.

The speech parameters, both normal and shouted, can be shown very clearly by means of sound spectrography, time, frequency bands and even intensity can be checked in a single instant. Difficulties of speech perception in noise can be understood easier, when parameters of the noise can be seen on the same sonogram.

Both the intensity and the most important frequencies can be checked with cheeper and more common apparatuses, but these give significantly less information about these specific problems.

BAN/BEN OR BA/BE: A CASE OF "FREE" VARIATION

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Introduction
The linguistic variable -ban/-ben ('in') vs -ba/-be ('into')

Hungarian distinguishes two basic concepts when expressing spatial localization: One is position relative to an object (i.e. whether inside or on or next to it), the other is location versus direction to or from an object. The realization of these concepts can be represented by the corresponding nominal suffixes:

A.1.-ból/-ből ('from inside')
A.2.-ban/-ben ('inside')
A.3.-ba/-be ('into')
B.1 -ról/-ről ('from the surface')
B.2.-n/-on/-en/-ön ('on the surface')
B.3.-ra/-re ('onto the surface')
C.1.-tól/-től ('from')
C.2.-nál/-nél ('at')
C.3.-hoz/-hez/-höz ('to')

The choice between the variants of each suffix is governed by the rules of vowel harmony, which I will not discuss here.

The question words to be posed on the respective local expression differ only according to the location versus direction to and from (factors 1. 2. and 3.) but not according to position (factors A. B. and D.).

1. honnan? 'where from'
2. hol? 'where'
3. hová? 'where to'

The system of the locative suffixes outlined above seems to be fairly stable, except that -ban/-ben 'in' (the inessive suffix) is sometimes realized in speech as -ba/-be 'into' (the illative suffix). Although the result of this variation in spoken language has been the neutralization of the opposition between the inessive form and the illative form, the opposition of the two meanings has not been neutralized. This can be proven by the fact that speakers are well aware of the difference between the questions hol? 'where' and hova? 'where to'. For example, while sentences like

Az iskolába' voltam.
(the school+into was+I)
'I was in the school.' (non-standard)

are very often said instead of the standard sentences like

Az iskolában voltam.
(the school+in was+I)
'I was in the school.' (standard)

it is ungrammatical to ask

c)*Hová voltál?
(where+to you+were)

instead of

d) Hol voltál?
(where you+were).

The loss of -n at the end of a word seems to be a "natural", phonetically motivated process, similar to that of the disappearance of the -m at the end of the word sem ('neither'). However, the phenomenon discussed here is morphologically constrained to the inessive noun ending, as in other morphemes (e.g. jobban ('better') or dobban ('it beats') -ban or -ben is unlikely to become -ba or -be and speakers would never say that "jobba" is just the same as jobban.

The -ban/-ben suffix does not always have a locative function. Words with the inessive suffix can also have a temporal, a modal or some other function related to some special verbs or expressions, and in these functions the loss of the final -n also occurs. For example:

Januárba(n) hideg van.
(January+in cold is)
'It is cold in January.'
Titokba(n) mást gondol.
(secret+in else thinks+he)
'Secretly he thinks something else.'
János hisz az igazába(n).
(John believes the truth+his+in)
'John believes that he is right.'

Theoretical background

The phonological model I tried to apply to this phenomenon is the framework of Natural Phonology as described in Donegan and Stampe 1979 and in Dressler-Wodak 1982; Natural phonological processes derive phonetic surface forms from phonological representations; these processes are either fortition (clarification) processes serving perceptibility or lenition (obscuration) processes serving ease of articulation. Many of these processes do not apply obligatory: Lenitions are more inhibited in formal speech and less or not inhibited in informal speech, fortitions the other way round. These varying phonological inhibitions are triggered by psychological and sociological factors. Lenitions are being generalized /maximized the less formal the speech is, fortitions the more formal it is. Fortitions are usually context free, lenitions context sensitive processes.

Historical background

Even the first written grammars of the Hungarian language (dating from the 16th century) pay attention to the variation of the inessive suffix, and formulate the normative rule in the same form as it has been described above. (i.e. one should use

-ban/-ben when the corresponding question is hol?.) Many of the 19th century poets still use the -ba'/-be' form instead of -ban/-ben, although they do indicate the "absence" of the final -n with an apostrophe. Contemporary normative grammars usually mention this phenomenon, pointing out that the dropping of the final -n in the inessive suffix is considered to be of casual or familiar usage, and it should be avoided in formal speech, as well as in writing.

As the variation of -ban/-ben and -ba/-be has been persisting for several centuries, it is not at all evident whether it reflects a fortition (clarification) or a lenition (obscuration) process. The inessive -ban/-ben suffix was already present in the earliest written document in Hungarian dating from the 12th century. If the dropping of the final -n did take place in this earlier period (a possibility which can not be excluded), there was no coincidence with the illative form as it had the form belé ('into') during that period, so the possible dropping of final -n did not affect the differentiation in the two functions. Anyway, sometime before the 16th century with the change of the illative form from belé to -ba/-be, the illative and the inessive suffixes started to coincide. Therefore, given that cases of "free" variation in most instances reflect an on-going process of linguistic change, the process of lenition (the neutralization of the opposition between the inessive and the illative suffixes) must have been extremely slow, as the variation has been persisting for several centuries, at least since the 16th century.

However, the theory of fortition cannot be excluded. If we suppose that a systematic neutralization of the inessive and illative forms did take place before the introduction of the written standard, this standardization changed the direction of the process: it reinforced the differentiation of the two functions by differentiating the two forms (-ban/-ben vs. -ba/-be) which then influenced the differentiation within the spoken standard, as well.

Evidence from the Budapest Sociolinguistic Interview

Version 2 of the Budapest Sociolinguistic Interview conducted with a quota sample (N=50) of adult Hungarians living in Budapest, differing in age, sex and education, was recorded in 1987. It contains elicited data for various analyses and about 30 minutes of guided conversation.

For the purpose of this preliminary study 8 out of the 50 persons of the quota sample of version 2 of the Budapest Sociolinguistic Interview were selected (2 university students, 2 schoolteachers over the age of 50, 2 factory workers one of them older than 40, the other younger than 30, and 2 shop-assistants, also an older and a younger one).

Elicitation methods in the first part of the sociolinguistic interview include reading out minimal pairs, word lists and short passages, the latter both at normal and fast tempo. This way each interview provides us 37 items of -ban/-ben (or -ba/-be) forms. Out of the 37*8=296 items only 32 were actually read as -ba or -be, and 14 of those 32 were produced by the same person, an older worker, who did not even once produce a -ban/-ben item during the guided conversation. (Nevertheless, in tests, he produced it 23 times.) As the attention drawn to the written form diminished, cases of the "dropping" of -n increased, but in all the reading tests it remained rare. Among the 20 minimal pairs to be read aloud three were relevant to the problem (ember-emberben, 'man-man+in' erdőben-erdőbe, 'forest-forest+in' kertbe-kertben 'garden-garden+in'). All relevant items were read with a clearly perceptible -n by all the informants. In fill-in tasks it was the one special informant mentioned above who produced only the -ba/-be forms. Four out of the eight informants read the suffix each time with the final -n. As for the effect of speed in reading texts, in most cases when the -n dropping did take place, it happened both in normal and fast tempo. Except for the one special informant mentioned above, whenever it occurred only once, it was during fast reading.

The results of the tests show that not only the written norm has the final -n but the pronunciation in reading aloud written texts also maintains it. It is the dropping that is exception in reading.

The analysis of spontaneous speech gives quite different results. None of the informants produced exclusively -ban/-ben forms.

In tables 1. and 2. I have arranged the observed occurrences of the inessive suffix according to two criteria which seemed to be most likely to produce relevant differences in the distribution of the two forms: phonetic environment on the one hand, that is whether there is a vowel, a consonant or a pause following the suffix, and function, on the other hand. My hypothesis was, that if there is a lenition process underlying the variation of ban/ben, than the more-or-less type rules governing the variation will be dependent on the phonetical environment, while if it is a fortition process, these rules will have something to do with the function of the suffix.

table 1.

function	presence of -n (%)	Absence of -n (%)	total(100%)
locative	43 (45)	53 (55)	96
temporal	24 (43)	32 (57)	56
modal	15 (42)	21 (58)	36
other	25 (44)	32 (56)	57
total	107 (44)	138 (56)	245

Chi-Square = .1237047 p = .9888484

table 2.

segment followed by	-n present cases %	-n absent cases %	total (100%)
pause	48 (53)	43 (47)	91
consonant	32 (36)	57 (64)	89
vowel	27 (41)	38 (59)	65
total	107 (44)	138 (56)	245

Chi-Square = 5.321483 p = .069896

As the tables show, the variability of -ban/-ben and -ba/-be forms seems not to correlate with either of the two criteria. Analysis of the

individuals' usage shows that some people are much more likely to use -ba/-be forms than others. (see table 3)
table 3.

person	-n present	-n absent	total
teacher 1	2	27	29
teacher 2	24	11	35
student 1	53	16	69
student 2	8	27	35
shopass.1	7	2	9
shoppas.2	11	16	27
worker 1	0	29	29
worker 2	4	10	14

As it was expected, teachers and students seem to be more likely to use the form corresponding to the written norm, but the differences were not very great. Analysis of the given data does not provide evidence of any statistical probability of the occurrence or absence of the final -n except for the distinction between reading aloud texts and guided conversation.

Conclusions

Differences between the results of the elicitation experiments (including reading texts aloud) and the analysis of the guided conversations suggest that, as far as this variable is concerned, there might be two separate codes in Hungarian: one for the written language (which is also observed when texts are read aloud) and one for speech. It would be difficult to claim, however, that a code-switching is taking place each time, as several cases can be observed when both forms occur in the same sentence. (for example:

Ebbe a farmerban nem mehetsz színházba.
(this+into the blue-jeans+in not go+may+you theater+into)
'You may not go to theatre in this blue-jeans.')

There were two criteria which seemed to be most likely to underlie the observed variation:

- one would expect that, serving the ease of articulation, the dropping of the final -n would be more frequent before a consonant than before a vowel or a pause, especially if there is a lenition process underlying the variation, lenition processes being usually context sensitive.

- on the other hand, one would expect that, especially with fortition process underlying the variation, the distinction of the two suffixes would be reinforced mainly in those cases when these suffixes actually have a distinctive power. In locative function it is usually possible to imagine a situation where the illative suffix could be used with the same word. (In the case of temporal function this possibility is very restricted, and the illative function is out of question in the case of governed complements.) Nevertheless, it should be noted that in most of the cases even in locative function, where minimal pairs are possible, the distinction between the inessive and illative suffixes is usually redundant, as other syntactical components of the sentence usually make it clear which of the two suffixes should have been used.

Analysis of the given data provides evidence neither of a difference according to function nor of a difference according to phonetic environment. Although the extension of the analysis to a larger corpus might still provide new evidence, after this preliminary study it seems that for finding the rules (if there are any) governing the observed variation of the Hungarian inessive suffix we have to search for some other criteria than those of phonetic environment or function. The fact that some people are more likely to produce the standard forms than others suggests that this variation should be described in terms of the socioeconomic status and the linguistic consciousness of the speakers.

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SOZIOLINGUISTIK UND PROBLEMATIK DER AUSSPRACHE

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In unserem Beitrag befassen wir uns mit der Problematik der Forschung der Standardaussprache, und zwar sowohl vom Gesichtpunkt der Stildifferenzierung der Aussprachenorm, als auch vom Gesichtpunkt der Festlegung der akustischen Mittel, die - in Ordnung mit den Mitteln anderer Sprachebenen - ihre spezifische Stilgeltung aufweisen. Es handelt sich also um Ermittlung und Beschreibung der objektiven Aussprachenorm. Die Beschreibung der akustischen Mittel der tschechischen Sprache konfrontieren wir mit Ergebnissen der Forschung, in der wir soziolinguistische Methoden applizieren.

In einem Teil der Forschung, über den wir ausführlich berichten wollen, orientieren wir uns auf Ermittlung der Einstellungen, die ausgewählte Gruppen der Sprecher sowohl zu einigen allgemeineren Fragen, als auch zu ausgewählten konkreten Problemen der Aussprache nehmen. Es handelte sich um repräsentative Gruppen von Schauspielern, Juristen und Studenten der pädagogischen Hochschulen.

Unter dem Begriff "Einstellung" verstehen wir im üblichen soziologischen Sinne die Neigung einer Person oder einer Gruppe von Personen, bzw. einer ganzen Gemeinschaft, bestimmte Ziele, Handlungs- und Verhaltensweisen vorzuziehen und andere abzulehnen (1). Diese Neigung beeinflußt dann Antworten auf einzelne Typen der Situationen - in unserem Fall der sprachlichen Situationen. Die Einstellungen der Sprecher beziehen sich vor allem auf die Schriftsprache, die eine national-repräsentative Funktion erfüllt.

Die Angaben wurden mittels eines Fragebogens gesammelt, der aus einem Komplex der Fragen zusammengestellt wurde. Sie wurden in folgende Gruppen geteilt:

a) Fragen, die gesamte, allgemeine Einstellungen der Befragten ermitteln sollten;

b) Fragen, die auf Sprachkenntnisse und -praxis (z.B. öffentliche Auftritte, Ausübung öffentlicher Funktionen) der Befragten orientiert wurden;

c) Fragen, die feststellen sollten, wodurch die Einstellungen motiviert wurden, bzw. in welchem Maße die befragten Personen Quellen ihrer Meinungen zur Kenntnis nehmen (Rundfunk und Fernsehen, Kultur, Fremdsprachkenntnisse usw.).

Einzelne Fragen bezogen sich auf verschiedene Aussprachetypen: auf die neutrale, explizite und implizite Aussprache. Diese Aussprachetypen wurden so gegliedert, um im Prinzip den grundlegenden Funktionsstilen zu entsprechen. In diesem Zusammenhang interessierte uns vor allem, in welchem Maße die Befragten den Aussprachestil vom Funktionsstil der gesprochenen

Äu3erungen unterscheiden. [1]

Das ganze Material wurde mittels des Computers statistisch ausgewertet. Es zeigte sich, da3 die ganze Menge von Einstellungen einzelner Sprecher in einige gegensätzliche Paare geteilt werden kann.

1. Als der wichtigste erschien der Gegensatz "rational" versus "irrational", wobei unter dem Begriff "irrational" die überwiegend emotional motivierte Einstellung zu verstehen ist. Es handelt sich also keinesfalls um ein negatives Einschätzungskriterium. Die emotionalen Einstellungen nehmen im Handeln der Menschen das Primat ein, und das betrifft nicht nur die Einstellungen zur Sprache. Bei der Arbeit auf dem Gebiet der Sprachkultur kann man die emotionalen Einstellungen nicht unterschätzen, im Gegenteil mu3 man mit ihnen rechnen, weil sie mit der emotionalen Beziehung zur Nationalsprache eng verbunden sind.

Die emotionalen Einstellungen waren z.B. in der Schauspielergruppe markant, uzw. in Antworten auf die Frage, ob auf sie die sog. "offenen" Vokale störend wirken. (Es handelt sich um eine sehr expansive Erscheinung in den gegenwärtigen gesprochenen tschechischen Äu3erungen.) Die überwiegende Mehrheit der Schauspieler antwortete kategorisch "ja", ohne Rücksicht darauf, ob es sich um die akustische Realisierung künstlerischer oder nicht künstlerischer Texte handelte, und in manchen Fällen führten einzelne Respondenten spontan neue Einschätzungskriterien an (z.B. kommunikativ, ästhetisch).

In den Einstellungen zu einigen Ausspracheerscheinungen zeigten sich auch interessante Generationsunterschiede. Als Beispiel können die Einstellungen zur folgenden Frage dienen: Wirken auf Sie die sog. offenen Vokale in den Schauspieleräu3erungen als ein störendes Element. Diese Frage wurde von 80% der Schauspieler im Alter von 25-39 Jahren, von 97% im Alter von 40-54 Jahren und von 82% im Alter von mehr als 54 Jahren bejaht, während in der jüngsten Alterskategorie von 19-24 Jahren diese Frage nur von einer nicht ganzen Hälfte (47%) eindeutig bejaht wurde.

2. Ein weiterer wichtiger Gegensatz, der bei der Auswertung des Fragebogens in Erscheinung trat, war der Gegensatz zwischen dem wirklichen sprachlichen Handeln eines bedeutenden Teils der Respondenten und ihren Ansichten und Einschätzungen einiger Ausspracheerscheinungen. Dieses Gegensatzes sind sich die Sprecher meistens nicht vollkommen bewu3t. Das zeigte sich konkret z.B. darin, da3 eine Reihe von Respondenten in ihren gesprochenen, vom Funktionsstil des Textes nicht motivierten Äu3erungen ganz andere Aussprachevarianten benutzte, als sie in ihren Antworten proklamierte. [2].

Ergebnisse unserer Forschung bestätigten unter anderem auch unsere Ausgangsvoraussetzung, da3 bestimmte Gruppen der Sprachbenutzer (mit der gleichen sozioprofessionellen Orientierung) auf bestimmte Aussprachetypen übereinstimmend (positiv oder negativ) reagieren. Die verarbeiteten Daten bewiesen gleichzeitig, da3 die Einstellungen der Sprecher zu den Ausspracheunterschieden einiger Erscheinungen (resp. einiger Gruppen von Erscheinungen) differenziert sind. Die ausgeprägtesten waren die Einstellungen zur Aussprache der Dublette s/z, am wenigsten ausgeprägt waren die Einstellungen zur Vokalquantität in den Lehnwörtern, und die mittlere Stelle nahmen die Einstellungen zur Quantität tschechischer Vokale ein. Besonders in diesem Fall zeigten die Antworten, da3 die Benutzer der Schriftsprache verhältnismä3ig genau den Aussprachestil vom Funktionsstil der Ausserung unterscheiden. Sie sind sich volkommen bewu3t: die akustische Gestaltung der Au3erung in hohem Ma3e die beabsichtigte Wirkung auf die Hörer beeinflu3t.[2]

Vom Gesichtspunkt der Kodifizierungsarbeit auf dem Gebiet der Standardaussprache war für uns auch die Feststellung bedeutend, da3 im Zusammenhang mit den Veränderungen in der Einschätzung einzelner Aussprachevarianten auch die Grenzen zwischen einzelnen Aussprachestilen verschoben werden. Die Grenzen ändern sich im Zusammenhang mit der Entwicklung der ganzen Aussprachenorm. Die schriftsprachliche Aussprachenorm hat in jeder Entwicklungsphase ihre zentralen und peripherischen Gebiete. In den zentralen Gebieten ist die Norm schon ausgeprägt, während in den peripherischen Gebieten die Norm erst entsteht.

Der Proze3, der zur Verschiebung der Grenzen der Aussprachenorm führt, beginnt immer mit der Bewegung der stilistischen Charakteristiken der Aussprachevarianten. Es ist bekannt, da3 die Aussprachenorm für die übliche Kommunikation vor allem stilistisch neutrale Mittel braucht. Sobald es zur Verschiebung einer Aussprachevariante auf eine höhere Stilebene kommt, kommt es gleichzeitig auch zu stilistischen Verschiebungen der Aussprachevariante aus dem niedrigeren Stil in den neutralen Stil.

Resultate

Wir untersuchten einzelne Gruppen der Respondenten vom Gesichtspunkt ihrer Fähigkeit, über stilistische Aussprachevarianten nachzudenken. Aus den Ergebnissen unserer Untersuchungen ergibt sich, da3 über diese Fähigkeit diejenigen Respondenten verfügen, bei denen die rationalen Einstellungen zur Einschätzungen der meisten Ausspracheerscheinungen überwiegen (uzw. ohne Rücksicht auf ihre berufliche Orientierung).

Bei der Festlegung der Bedingungen, die die Wahl des Aussprachestils beeinflussen, zeigte sich als die markanteste die Beziehung zwischen dem Aussprachestil der Äu3erung und dem Funktionsstil des Textes. Wir sind uns selbstverständlich dessen bewu3t, da3 der Begriff "Funktionsstil" mit dem Begriff "Aussprachestil" nicht identisch ist. Wie wir im Abstraktum unseres Beitrages angeführt haben, ist die Aussprache traditionsgemä3 vertikal differenziert (der neutrale, gehobene - resp. explizite - und umgangssprachliceh - resp. implizite - Stil), während die Klassifizierung der Funktionsstile horizontal erfolgt (der informative, administrative, publizistische Stil usw.). Die Korrespondenz zwischen dem Aussprache- und Funktionsstil ist allerdings bindend.[3]

Bei der Ermittlung der Beziehung zwischen der realen und proklamierten Aussprache untersuchten wir auch ein Reportoire der Mittel, die den Aussprachestil bilden. Hier mu3 man bemerken, da3 sich dieses Repertoire natürlich nicht nur auf die Aussprachevarianten einzelner Laute oder

Lautverbindungen beschränkt, sondern da3 es auch von der Klanggestalt der Sätze und der zusammenhängenden Äu3erungen gebildet ist. Die akustischen Mittel der Gliederung der zusammenhängenden Äu3erung (d.h. Satzintonation, Phrasieren, Pausen, Wort- und Satzakzent, Sprechtempo usw.) sind in der konkreten Äu3erung eng verbunden und können sich einander vertreten. Bei der Einschätzung des Aussprachestils der Laute und der akustischen Gestalten deren Kombinationen, sowie der Mittel der suprasegmentalen Ebene reicht dann die gewöhnliche dreistufiege Gliederung der Aussprachestile (der neutrale, gehhobene und niedrige, resp. explizite und implizite Stil) nicht mehr aus, und man mu3 noch Zwischenstufen bilden.

Bemerkungen

1. Z.B. im Fragebogen für Schauspieler wurden einzelne Fragen folgenderweise erweitert: wirken die sog. offenen Vokale, falsche Vokalquantität, die nicht schriftsprachliche Realisierung der Konsonanten usw. auf Sie als störendes Element: a) bei der Realisierung eines dramatischen Textes, b) beim künstlerischen Vorträgen der Poesie, c) beim künstlerischen Vorträgen der Prosa, d) bei den fachlichen Vorträgen, e) bei den politischen Äu3erungen, f) bei Sportreportagen? Auf alle angeführten Fragen konnte man eine der vier Antworten geben: ja - manchmal - niemals - ich wei3 nicht.

2. Dieser Gegensatz zeigte sich besonders in zwei Generationsgruppen der Schauspieler im Alter von 25-39 Jahren und 40-54 Jahren. Die Konfrontation der proklamierten Einstellungen mit der konkreten Analyse ihrer mündlichen Äu3erungen sowohl auf der Bühne, als auch im Fernsehen bzw. im Rundfunk zeigte den Widerspruch zwischen den kategorischen Einstellungen zu den offenen Vokalen, zur Aussprache einiger Typen der Lehnwörter (besonders mit der Vokalquantität), aber auch einiger Erscheinungen aus dem heimischen Wortschatz.

3. Z.B. in der tschechischen Sprache kommt eine Reihe von Fällen vor, wo der stimmlose Konsonant /s/ in Lehnwörtern immer häufiger durch den stimmhaften Konsonant /z/ ersetzt wird. Oft handelt es sich dabei um solche Worttypen, denen die Kodifikation das Statut "schriftsprachlich" noch nicht verliehen hat, die aber allmählich zum Bestandteil einer kultivierten sprachlichen Kommunikation werden.

Z.B. für die Angehörigen der jungen Generation haben die Dubletten mit /z/ schon einen neutrale Stilcharakteristik, während die Dublette mit /s/ bei ihenen in einigen Fällen in den Bereich des schon etwas expliziten Aussprachestils verschoben wird. Dies betrifft z.B. die Wörter "renesance", "resort", in denen man den s-Laut sowohl schreibt als auch ausspricht, bei denen man aber beginnt, die Aussprache mit dem /z/ zu gestalten, die bisher als lässige Aussprache bezeichnet wurde. Laut der gegenwärtigen Aussprachenorm wird die Aussprache mit /z/ in den meisten Fällen als nicht schriftsprachlich charakterisiert. Dem widerspricht jedoch das sprachliche Bewu3tsein der Sprachbenutzer, die sie (ohne Rücksicht auf Territorial- und Generationsunterschiede) als stilistisch neutral einschätzen.

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MORPHEMES OF CV AND VC STRUCTURE IN THE ARMENIAN, GEORGIAN, HUNGARIAN AND TURKISH LANGUAGES

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We should like to present an outline of a distributional-phonemic analysis of root and affixal CV and VC type morphemes in four languages differing in origin: Armenian, Georgian, Hungarian, and Turkish. It is hoped that observation of these structures will explain a number of phonetic processes in the languages just cited and will allow to draw certain conclusions on the basis of typological research.

Root and affixal morphemes of CV and VC structure have not been studied from this point of view in the indicated languages.

The auxiliary parts of speech have not been included in the investigation; borrowings have also been excluded. The pronunciation has been taken into account, for in Armenian the pronunciation and spelling frequently differ.

A comprehensive study of the root structure sometimes necessitates a diachronic conceptualization of the phenomenon. Hence, recource is made to Old Armenian, although the roots are considered in the synchronic aspect. The root and affixal morphemes are analyzed separately.

The CV structure does not occur frequently in Armenian. Instead of the theoretically expected 256 roots only 16 have been actually identified, of which only one is verbal (di-). In the roots of this structure the vowels /a/, /e/, /ə/, and /o/ do not occur. The pronouns da, na, sa form an exception.

In Armenian 54 roots (39 nominal and 9 verbal) of VC structure have been found. The /e/, /ə/ and /o/ vowels do not occur in VC-type roots. Nominal roots predominate in morphemes of both structures.

There are only four affixal morphemes of CV structure (-ya, -ni, -va, -i), all being suffixes.

In Armenian 50 grammatical morphemes of VC structure are found to function; of these only 2 are prefixes (an-, ar-), 3 are infixes (-an-, -en-, -ot-), and the rest are suffixes.

Both in root and in affixal morphemes the VC structure predominates over its CV counterpart.

The study of the root structures appears to be promising, for it will help to explain a number of phonetic processes and exceptions in Modern as well as in Old Armenian.

In morphemes of CV structure /a/ and /o/ are so unnatural that - as will be seen below - they are used in these structures only in the artificial forms of the names of the letters of the alphabet. This accounts for the fact that Old Armenian /aj/ and /ej/ diphthongs failed to become simplified in CVCV=a o C=j structures, in root morphemes (e.g. haj), or at morpheme boundary (goj), while at the absolute end of words it has become simple in all positions.

The vowel /i/ is lost when it precedes a vowel. One-syllable roots form an exception to this rule: following the loss of accent in such roots the /i/ is retained in flexion and derivation both in Modern and in Old Armenian, which is accounted for by the structure of the root. In the case of the loss of /i/, a ci-type root should have yielded a C structure, which is alien to Armenien.

In closed syllables the vowels /i/ and /u/ suffer changes, either being lost or yielding ə. In Old Armenian normative grammars one-syllable roots, in which /i/ is not lost, form an exception to this rule; exceptions are cited in which /i/ undergoes a change, yielding (inǰ > ənǰu, iłǰ > əłǰi, etc). All the exceptions are of VCC (=VSC) structure. The structure of the root seems to be crucial here rather than the number of syllables. The vowel in the root of VC structure cannot be lost, for that would yield a C structure, which - as noted above - is an unnatural structure for Armenian. With regard to the VCC(=VSC) structure, in the case of the loss of the vowel, the vowel /ə/ appears before a sonorous sound to affect the consonants, thereby preserving the structure unaltered.

This is confirmed also by the change of the /ē/ diphthong in Old Armenian: in the unstressed position /ē/ yields /i/. In contrast to the vowels /i/ and /u/, in one-syllable roots beginning with a vowel /ē/ admits of no exception, such roots being only of VC and VCC structure and both remaining unaltered. Thus, the ē/i alternation is due to the structure of the root. This statement is supported also by the following fact: in the athematic roots of Old Armenian the final /n/ was lost in the VCn position. Had the VC position been unnatural for Armenian, the /n/ would have behaved similarly to /y/, i.e. it would not have been lost.

In Georgian, 18 roots (12 nominal and 6 verbal) were identified. Morphemes containing the vowel /u/ dominate both in verbal and in nominal roots. (Dialectical material confirms the same, though the data have not been taken into account).

In Georgian we have 27 roots of VC structure (27 nominal and 9 verbal), with the vowel o functioning in verbal morphemes. The vowel /a/ occurs only in one verb. In Georgian the vowel /i/ does not occur in any CV or VC structure of the root morpheme, the verbal root (-zi-) being the only exception. Not a single sonorous sound occurs in CV-type root morphemes, whereas all sonorous sounds are found in VC type root morphemes.

The prefixes and suffixes differ structurally in affixal morphemes. Prefixal morphemes are of CV structure, and suffixal, of VC structure. The only exception is {ay-}, which is a prefix of VC structure. As might be expected, component I of circumfixes is of prefixal morpheme structure, while component II, of suffixal morpheme structure. There are 18 prefixal morphemes in all, of which 10 are components I of the circumfix. Suffixal morphemes number 31, of which 6 are components II of the circumfix.

In Georgian, VC structure predominates over CV both in root and in affixal morphemes. In both structures nominal roots predominate over verbal ones.

In Hungarian, instead of the theoretically assumed 364 combinations, 42 root morphemes were identified - 32 nominal and 6 verbal. Labial vowels occur in 28 roots, and nonlabial in 14. All the labial vowels are long, with the only exception of /čö/. In the nonlabial vowels short ones dominate. We have one exception for /a/ and /e/ and two exceptions for the vowel /i/ (bá, lé, rí, sí).

Examination of the arrangement of vowel sounds has shown the impermissibility of /á/, /é/ and /o/ in root morphemes of CV structure. Neither do these vowels occur in V position. Probably this accounts for the fact that the final /a/ and /e/ in loanwords yield /a/ and /e/, and /o/ - /ó/ even in words borrowed from languages that have no long vowels (Turkish, Slavic, Latin, Ossetic).

The arrangement of vowels must also be responsible for the fact that the formers of the conditional mood -ná, -né, in the 3rd person plural of the Present Tense subjective conjugation, in which the marker of the 3rd person is expressed by a zero allomorph, yields -na, -ne. In the objective conjugation these remain unchanged, in order to preclude the overlapping of forms. The reduction of /á/ and /é/ in subjective conjugation is clearly due to the lack of a marker of the person, for when affixes are added to roots ending in /a/ and /e/ they lengthen in general.

Fifty-eight root morphemes of VC structure were identified in Hungarian, of which 45 are nominal and 11 verbal. Unlike CV-type root morphemes, here nonlabial vowels exceed labial ones in number: nonlabial vowels are found in 35 roots, and labial ones in 23. Long vowels exceed their short counterparts in number in both labial and nonlabial categories: 23:12 and 13:10 respectively.

There are few prefixes in Hungarian, 4 being of CV and 1 of VC type. Both structures occur in suffixes, with VC predominating (22:14). Nonlabial vowels dominate in suffixes (31:11). Labial vowels are totally absent in prefixes. Short labial vowels do not occur in CV-type affixes, similarly to the root morphemes of the same structure. Synharmonic variants do not function in affixal morphemes. VC structures predominate in suffixal morphemes, as well as in root morphemes.

In Turkish, synharmonism is not only a phonetic process but a basic phenomenon that functions at the three levels of the language.

Taking into account the law of harmony of vowels and consonants, the affixes given in 8 variants in the normative grammars have been here taken as a single unit, affixes attachable to nouns with a vowel stem serving as the point of departure.

Of the 152 possible combinations of 19 consonants and 8 vowels the CV structure was found only in 5 root units (bu, he, su, sü, šu).

Roots of VC structure are much greater in number than those of CV structure (87:5). Of the Turkish affixal inventory, 19 suffixes are of CV and 14 of VC structure. (Prefixes are absent in Turkish).

In root morphemes nominal roots predominate over verbal ones (51:36).

In studying the CV and VC structures the designations of the letters were introduced into the material under investigation, thereby bringing to light the principle of the naming of the letters: the alphabetic name of a letter begins with the same letter. The designations of f, l, m, n, r, s, and sz in Hungarian form an exception, being an analogy of Latin.

The Turks changed to the Latin system of writing in 1928. The designation of the letters was solved simply: the vowel e was added to all consonants, resulting in a uniform alphabetic order of CV structure. As noted above, this structure is unnatural for Turkish.

A comparison of the canonical forms used as the names of the Armenian, Georgian, and Hungarian alphabets with the structures of root and affixal morphemes has shown that, in the three languages just cited, structures not used in root and affixal morphemes are employed as letter designations. Thus, in Georgian a root morpheme of CVC structure does not occur as a word form (the pronouns šen, mag and the adverbs zeg, šig, šin are exceptions). This unused pattern was employed as the names of consonants.

In Armenian the designations of 23 letters are of CV structure. The vowels /i/ and /u/, which are quite natural for this position, are each employed only once. In 21 cases use has been made of /a/, /e/, and /o/, which was impermissible not only in this position but also at the absolute end of root morphemes of any structure in Old Armenian.

The Latin alphabet served as the prototype of its Hungarian counterpart. The designations of the consonants are of CV structure, and to the Latin e Hungarian corresponds e, resulting in an artificial form, for e is unnatural in this position, and in general at the absolute end of a word. Seven consonants of VC structure in Latin are marked by the VC_iC_i structure, which is not characteristic of Hungarian.

Thus, in naming the letters, the compilers of the alphabets, being intuitive linguists, deliberately employed artificial forms.

To sum up the foregoing, a distributional analysis of phonemes in root- and affixal morphemes of VC and CV structure in four unrelated languages (Armenian, Georgian, Hungarian, and Turkish) has shown that: a) nominal roots are much in excess of verbal one, b) in the four languages studied VC structures predominate over their CV counterparts in root as well as affixal morphemes, and c) the sound segments used as designations of the letters in these alphabets are artificial forms and are not found in root morphemes.

TYPES OF SECONDARY WORD STRESS

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In the majority of word stress languages there is only one primary stress in a word: in Russian different syllables may be stressed; in German it tends to occur in the stem syllable and it falls on the beginning of words; in Spanish it occurs in the last or one before the last syllables. However in English words having separable prefixes and in compound words there may be two equally strong primary stresses, and in abbreviated compounds and abbreviations - even three or four. For instance: 'week-'end, 'radio'active, 'normal 'school, 'il'legally, USA /'ju'es'ei/, USSR /'ju'es'es'a/. The word accentual pattern with equal stresses is considered to be productive in English.

In word stress languages a polysyllable can possess not only a primary but also one or more secondary stresses of various types which differ in position and functions and ways of the phonetic realization.

One of the types of the secondary word stress - the morphological stress - is determined by the morphological structure of the word and occurs in compounds and abbreviated compounds (more often in polysyllables), abbreviations, in the words whith accentually prominent morphemes (prefixes, suffixes).

Thus, in Russian this stress may mark a non-final stem of the compound or abbreviated compound (,лесозаго'товки, ,соб'кор), a non-final element of the initial abbreviation (ЧП /,че'пэ/, МК /,эм'ка/, some prefixes either borrowed or Russian by origin (I): (,ультрасовре'менный, ,деколониали'зация, ,послеопераци'онный).

The words of the analogous morphological structure with two prosodic heads can be found in English (a'larm-,clock, 'air-,hostess, 'any,body, ABC /'eibi:'si:/, 'ante,chamber, 'sub,structure) - (2; 6; 9), in German ('Schreib,tisch, 'Auf,bau, ,rot'weiß) - (5; IO; II), in Spanish ('bienve'nida, 'campo'santa) - (4). It should be said that in German both prefixes (separable - "trennbare"), and suffixes with unreduced vowels ("schwere") may be accentually prominent morphemes ('aus,nehmen, 'Nacher,zählung, 'Wirtschaft, 'Freiheit, 'arbeitslos); in Spanish - suffix -mente ('facilmente); in English - "separable" prefixes and "prominent" suffixes with an unreduced vowel ('subva,riety, 'non-con,ducting, 'amphithe,atre, 'demonstrate, 'beautify, 'socialize).

Depending on the number of stems and accentually prominent morphemes there may be one or several secondary stresses of the morphological type. For instance: двадца,типя,тиру'блевый, ,проф,техобразо'вание, ,М,Г'У; 'air-,speed'meter, 'air'vice-,marchal; 'Selbstbe,stimmungs,recht, 'Rot,kreuz,schwester.

The mutual placement of the primary and morphological secondary stresses is a characteristic feature of the rhythmical structure of a word in differet languages. In Russian secondary stresses always precede a primary stress; in German it more often follows a primary stress (it corresponds to the semantic value of different parts of German compound word: in the first place there is a determining part, in the second - a determined part). Compare compound words of an analogous structure in Russian and German: само,лётостро'ение - 'Flugzeugproduk,tion, ,радио'станция - 'Radiosta,tion, ,трёх'атомный - 'dreia,tomig.

The tendency for a strong beginning in German words determines shifting of the primary stress on to a separable prefix leaving only a secondary stress on the stem (both in a separate word and in speech, in which separable prefixes are in a final position in a phrase: 'ab,schreiben - Sie ,schreiben diesen 'Text 'ab).

In English the majority of compound words and a few simple words having separable prefixes follow the pattern: "a primary stress plus a primary stress", "a primary stress plus a secondary stress" (in which a prefix has a primary stress, the stem-a secondary stress): 'goal,keeper, 'finger-,alphabet. Simple words having unseparable prefixes may be formed on the pattern: "secondary stress plus primary stress" (with a primary stress on the stem and a secondary stress - on the prefix): ,inter'action, a'lign - ,rea'lign; the words having "prominent" suffixes may be formed on the same pattern with the primary stress on the suffix a secondary stress - on the stem: em'ploy - ,employ'ee, 'engin - ,engi'neer, gre'nade - ,grena'dier, 'picture - ,pictu'resque.

Thus, in spite of the tendency of the primary stress to fall on the stem syllable in English and German words having only a primary stress accentually prominent non-stem morphemes in a word having two stresses often take a primary stress, whereas in Russian non-stem morphemes in a word having two stress receive only a secondary stress.

A secondary morphological stress falls on the same syllable of the stem as a primary stress in the parent word: ва'гон - ва,гоноре'монтный, ,ety'mology - 'folk-,ety'mology, 'Birke + Ge'holz - 'Birkenge,holz, Bi'llett + 'Ausgabe - Bi'llett,ausgabe. When a parent word has a stress on a final syllable, and in case of a shifting stress in a parent word it falls on the syllable which is stressed in one of the derivatives from the same root or one of the grammatical forms of the word: кисло'та - ки'слоты - ки,слотоу'порный, 'image - i'magine - i,magi'nation. In Russian stems with the sequence of sounds -оло-, -оро-, -ере- the morphological secondary stress is shifted to the first syllable of this sequence: молоко - (мо'лочный) - ,молокораз'ливочный. connective vowels -о-, -е- in Russian compound words are always unstressed. Accentually prominent morphemes retain the etymological placement of stress:,около'солнечный, ,антиоб'щественный, 'Wieder,sehen, 'über,laufen.

Initial abbreviations (in letters) have the following stress patterns in different languages: in Russian - the pattern "secondary stress + primary stress" (as well as in compounds): ФПК /,эф,пэ'ка/, РСФСР /,эр,эс,эф,эс'эр/, ; in German they have one primary stress on the last component: SED /ɛs|e:'de:/, FDGB /ɛfde:ge:'be:/; in English they have equally strong stresses on each component or on the first and the last components:M.P. /'em'pi:/, BBC /'bi:'bi:'ci:/=/'bi:bi:'ci:/, USA /'jues'ei/.

The way of the morphological stress realization is analogous to the phonetic correlates of the primary stress but with a lesser degree of prominence. In languages characterized by the qualitativ difference between stressed and unstressed vowels absence or presence of the qualitative reduction of a vowel becomes one of the criteria in ascertaining accordingly presence or absence of a secondary stress or accentual prominence in a word. Compare: горнолыжный /ˌгорнъ'лыжный/ - /гърнʌ'лыжный/, хлебоуборочный/ˌхл'ебъу'боръчный-хл'ьбъу'бо-.../, agronomy /ə'grɔnəmɪ/=agronomics /ˌægrə'nɔmɪks/, expose /ɪks'pouz/ - exposition /ˌekspə'zɪʃən/, commune /'kɔmju:n/ - communicate /kə'mju:nɪkeɪt/, versorgen /fɛr'zɔrgən/, Arbeiterschaft /'arbaetərʃaft/.

A morphological secondary stress regulates some other phonological processes in the word stem analogous to a primary stress in the given stem used in isolation. For instance, in Russian word having a secondary stress there are signals showing the ends of the adjacent words, these signals are connected with devoicing of the voiced consonants, darkening of palatalized sounds, absence of palatalization in assimilation, placement of allophones /j/ on the stem ends: ˌблизле'жащий /с/, ˌзавот'делом /ф/, ˌмединсти'тут /-дын-/, ˌмед'техника /-тт'-/, ˌстройо'тряд /-ойʌ-/, ˌдет'ясли /-тjа-/.

A morphological secondary stress performs the same constitutive function to a stem within a compound word as a primary word stress does to the whole word. In case of loss of the meaning by the stem a Russian secondary stress is lost, this process is accompanied by phonetic changes. In connection with this process changes in the phonetic and accentual characteristics of words are observed.

In English polysyllable having two equally strong stresses the loss of the meaning by the constituent parts of the word leads to decrease of the degree of prominence and replacement of one of the primary stresses by a secondary one. The loss of the secondary stress does not take place; stressed syllables (having primary or secondary stresses) are distinctly opposed to unstressed ones. A secondary morphological stress is retaining in German in which a compounding is productive way of word-formation and accentual features of the stem syllable becomes one of the means in word-identification.

Another type of the secondary word stress - a rhythmical stress - is determined by the length of the rhythmic strusture of a simple or a compound word, and it occurs in a polysyllable (or a rhythmic group) containing a long prestressed sequence of syllables (more rarely - post-stressed sequence of syllables), it does not depend on the morphological structure of a word.

This type of stress is most vividly represented in French (3; 7; 8) having no word stress in the strict meaning of this term as individual characteristics of each word form; and primary rhythmical stress falls on the last syllable of the rhythmical group. In each rhythmic group there may by one or several more secondary stresses on the odd from the end of the rhythmic group syllables: avec ˌun cou'teau, il ˌrevient 'tard, contre la ˌveri'te, Naˌbuchoˌdono'sor. If a primary final stress has a delimitative function of division the utterance into rhythmic groups, a secondary rhythmic stress helps the convenience of pronouncing and it forms rhythm of French speech.

An additional prominence of syllables similar to the rhythmical secondary stress occurs in Spanish: the syllables which are one or two syllables after or before a stressed one become prominent: ,ami'stad, ,mari'nero, ,expe,rimen'tado, ,desem,burca'dero; 'rapi,do, fo'neti,ca (4). Unlike French having stress on the odd from the end of the word syllables Spanish rhythmic stress more often makes even from the end of the word syllables prominent and it may occur both before and after a primary stress.

In English a rhythmic secondary stress is manifested in different ways. It may be observed in simple polysyllable words and words having unseparable prefixes before a primary stress (and it is different from a morphological stress which more often follows a primary stress): ,maga'zine, ,eco'nomics, ,confi'dential. A number of English suffixes receive a primary stress and in this case in a long prestressed sequence of syllables there may occur a secondary stress coinciding or not with a primary one in the parent word: 'refuge - ,refu'gee, ab'sent - ,absen'tee. The other suffixes (often of Greck-Latin origin) remain unstressed and regulate the placement of a primary stress in a word shifting it on a vowel before a suffix that is the second or the third syllable from the end. In this case in the initial prestressed sequence of two or more syllables there occurs a secondary rhythmic stress coinciding or not with the stem syllable: 'negativ - ne'gation - ,abne'gation - ,nega'tivity, 'criminal - ,crimi'nology, 'lexical - ,lexi'cography.

Linguists usually do not differentiate between two types of English second stress possibly because of the identity of the means of their phonetic realization, in particular, absence of qualitative reduction of the vowel. At the same time there are views on some "prominence" of the number of suffixes containing unreduced vowels but having no secondary stress: 'celebrate, 'normalize, 'satisfy. Such "prominence" is similar to "prominent" ("schwere") morphemes in German (having unreduced vowels), also being considered unstressed. Since qualitative and quantitative reductions are usually interconnected, such syllables may be percieved as weakly stressed against the background of reduced unstressed syllables.

A rhythmic stress in Russian word of any morphological strusture is found on the fourth or the fifth prestressed syllables; it is accompanied by a qualitative vowel reduction, and it is expressed only by prolongation and probably by strenthening of a prominent syllable: ,запатенто'вать /зъ-/, ,целесо'образно /цъ-/, ,революци'онный /р'ъ-/. This type of stress is never observed in post-stressed sequence of syllables despite of the length of this sequence: 'сковородами /ъ/, 'жаворонков/ъ/.

Russian word may possess only one rhythmic stress which excludes a morphological secondary stress and may or may not coincide with it in placement in a word (when it coincides, that is there is a morphological stress on the fourth or fifth prestressed syllable, a rhythmic stress helps to retain a secondary stress in Russian word). It leads to different variants of pronunciation of a word: ,многонацио'нальный /,многъ-, ,мнъгъ-/, ,трагико'медийный /,тра-, ,тръ-/, железнодо'рожный /жы,л'е-, ,жъл'ъ-/.

Thus, in Russian the types of rhythmic patterns of the words having two or many stresses are different from the other languages. They may be represented in patterns: "a morphological secondary stress (stresses) plus a primary stress", "a rhythmic secondary stress plus a primary stress".

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PERZEPTIVE UNTERSUCHUNG EINIGER MELODISCHEN ELEMENTE DER DEUTSCHEN UND DER BULGARISCHEN REDE

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Einführung

In den gegenwärtigen Untersuchungen der Perzeption tonaler Redemodelle unterscheidet man zwei Niveaus der Frequenzanalyse: ersten Grades, die von den neuro-physiologischen Eigenschaften des menschlichen Hörsystems bestimmt ist; wie auch zweiten Grades, für die die Annahme gilt, sie schliesse bis zu einem gewissen Grade eine Bearbeitung von dem Zentralnervensystem ein (1,2).

Ziel dieser Arbeit ist es, folgendes experimentell zu überprüfen: inwieweit der Anschluss höherer (linquistischer) Ebenen die Wahrnehmung tonaler Redemodelle beeinflusst. Es werden: 1) die perzeptiven Urteile von Muttersprachlern zweier nicht eng verwandten Sprachen (Deutsch/Bulgarisch) über zwei Komplexe von Tonkurven (jeder für die jeweilige Sprache typisch) verglichen; 2) die Ähnlichkeiten und die Unterschiede der akustischen Merkmale , die in höchster Korrelation mit den perzeptiven Urteilen der Versuchspersonen (Vpn) stehen, festgestellt.

Experimentalmaterial

Als Grundlage der konfrontativen Untersuchung dient die funktionelle Übereinstimmung von Aussage- und Fragesätzen der beiden Sprachen, deren syntaktische Struktur und Kontext verschiedene Stellung der Satzbetonung vermuten liessen. Kurze Texte, die Ausprüche mit fast gleichem phonetischem Aufbau enthalten, sind von je 10 Probanden vorgelesen worden. Nach einer akustischen Analyse sind je 6 Ausprüche gewählt, entsprechend mit einer Deutschen und einem Bulgaren aufgenommen - mit typischer und korrekter Aussprache. Es wird mit folgenden Ausprüchen gearbeitet: A - elliptische Frage (Nach Amsterdam?/За Амстердам?); B - Entscheidungsfrage (Fährt <u>Anna</u> nach Amsterdam?/Ана <u>пее</u> ли за Амстердам?); C - Aussage (Anna fährt <u>nach Amsterdam</u>./ Ана пее <u>за Амстердам</u>.); D - Ergänzungsfrage (<u>Wer</u> fährt nach Amsterdam?/<u>Кой</u> пее за Амстердам?); E - Aussage (Anna <u>fährt</u> nach Amsterdam./Ана <u>пее</u> за Амстердам.); F - Entscheidungsfrage (Fährt Anna <u>nach Amsterdam</u>?/Ана пее <u>за Амстердам</u> ли?). Die Satzbetonung fällt auf die unterstrichenen Wörter.

Aus diesen Ausprüchen sind die letzten phonetischen Wörter (nach Amsterdam/за Амстердам) ausgeschnitten, die als Stimuli des auditiven Tests dienen. Aufgrund ihrer gleichen Wortstellung, ihrer Funktion als selbständige Ausprüche im

Test, ähnlichen Segmentenstruktur und gleichen Bedeutung könnte man annehemen, dass die perzeptive Beurteilung hauptsächlich auf ihren akustischen Merkmalen aufgebaut wird. Der unterschiedliche Grad des Vertrauens mit den tonalen Modellen für die beiden Gruppen von Vpn könnte sich in der Anwendung von verschiedenen Strategien bei Benutzung der akustischen Information äussern.

Perzeptive Teste

Mit jedem Komplex von 6 Stimuli ist ein Test nach dem Triadenvefahren (2X60 Triaden) angefertigt. Das erste Glied jeder Triade gilt als Muster und die Vpn bestimmen, ob das zweite oder das dritte Glied dem ersten ähnlicher ist.Die Teste sind mit zwei Gruppen von Muttersprachlern durchgeführt: 52 Deutschen (Hamburg) und 50 Bulgaren (Sofia). Die Hörerurteile sind nach dem Verfahren von Torgerson (3) bearbeitet. Als Ergebnis davon erhielt man 4 Matrizen der Abstände für jede Gruppe von Vpn mit jedem Komplex von Stimuli:(Dd),(Bd),(Db),(Bb).Diese Matrizen sind nach dem MDS-Verfahren (multidimensional scaling) mit Systat,ver.2.0-Programm nach dem Algorithmus von Kruskal an einem PC "Pravez 16"(16 Bit) bearbeitet. Die beste Konfiguration des psychologischen Raums wird durch die Anwendung von euklidischer Metrik (2 Dimensionen) erhalten (Stress=0-.028%, das Shepard-Diagramm ist fast eine Gerade). Die Ergebnisse von MDS sind auf der Abbildung dargestellt.

Korrelationen zwischen den perzeptiven und den akustischen Charakteristika der Stimuli

Zur Bestimmung der Korrelation zwischen den Skalenwerten auf den perzeptiven Achsen und den akustischen Parametern der Stimuli sind zweierlei Korrelationskoeffiziente (Pearson) angewendet: 1) mit den einzelnen akustischen Parametern (Anfangs-, Durchschnitts-, End- und Maximalfrequenz, Frequenzintervallen u.s.w.), die üblich mit der Intonation verbunden werden; 2) mit den Projektionen der Stimuli auf den Achsen des akustischen Raums. Die perzeptiven Urteile der Bulgaren nach 1. Dimension weisen höchste Korrelation mit der Durchschnittsfrequenz der Tonkurven auf: R(Bb)=.967, R(Bd)=.995, dagegen die deutschen Vpn - mit der Endfrequenz der Tonkurven: R(Db)=.951, R(Dd)=.994. Die zweite Perzeptionsachse hängt mit den Frequenzveränderungen zusammen: für die bulgarischen Stimuli - um den betonten Vokal: R(Bb)=.971,R(Dd)=.931; für die deutschen Stimuli aber - für die ganze Tonkurve: R(Bd)=.853, R(Dd)=.887.

Um die akustischen Charakteristika der ganzen Kurve miteinzubeziehen, sind die Stimuli als Vektoren in je einem : Frequenz-(12-/10-dimensionalen), Intensitäts-(6-/5-dim.), Dauer wert-(7-/6-dim.) und gesamten akustischen Raum (25-/21-dim.) dargestellt. In jedem Raum sind die Vektoren durch die Zahlenwerte der Stimuli (in charakteristischen Punkten der Kurve) definiert. Aufgrund dieser Werte sind die Matrizen der euklidischen Abstände berechnet und durch das MDS-Verfahren die Dimensionen der akustischen Raume bis auf 2 reduziert

(Stress=.028-7.7%). Die beiden Komplexe von Stimuli weisen eine hohe Korrelation zwischen ihren perzeptiven und akustischen Charakteristika für die beiden Hörergruppen auf, dabei sind sie bei den Bulgaren ein wenig grösser (z.B. im gesamten Raum - R(Bd-1.Dim)=.946; R(Dd-1.Dim)=.828). Die Unterschiede in der Korrelation mit den gesamten und den Frequenzmerkmalken sind für die bulgarischen Stimuli sehr klein. Die grössten Unterschiede liegen im Dauerwertraum sowohl für die deutschen als auch für die bulgarischen Stimuli (z.B. R(Dd)=.780, R(Bd)=.910).

Schlussbemerkungen

Die gesamte Anordnung der Urteile in den perzeptiven Ebenen von Deutschen und Bulgaren unterscheiden sich wenig voneinander. Angenommen, die psychologischen Achsen teilen die Ebene in 2 linguistisch relevante Zonen ein, so liegen im 1. und 4. Quadranten die Aussagen und im 2. und 3. - die Fragen; dagegen im 1. und 2. - die nicht betonten und im 3. und 4. - die betonten Stimuli. Unterschiedliche perzeptive Urteile haben die Gruppen vorwiegend bei solchen Stimuli, die keine melodische Entsprechung im Komplex der eigenen Sprache haben: D F (Bulgarisch) und B D (Deutsch).

Sowohl diese als auch die Ergebnisse der Korrelationsanalyse liessen möglicherweise verschiedene Perzeptionsmechanismen vermuten - ein selektives Urteil der Deutschen, das weniger von den einzelnen Parametern des ganzen Signals abhängt; für die Bulgaren aber ist das Urteil enger mit einer detaillirten Analyse der akustischen Merkmale verbunden. Das wird: 1) durch die verschiedenen Urteile der beiden Gruppen von Vpn über die deutschen Paare AF und BD; 2) durch die grösseren Korrelationskoeffiziente mit den Dauerwerten der Bulgaren unterstützt. Als "befreien" die "phonologische Dauer" und die strengere Wortstellung im Deutschen, die oft zur Endstellung der Satzbetonung führt, von einer detaillierten Analyse des tonalen Modells. Das bulgarische Sprachsystem dagegen, das die Dauer nur als suprasegmentàles Merkmal kennt und eine freiere Wortstellung zulässt, "verlangt" zuerst eine ausführlichere akustische Analyse, um zu linguistischer Lösung zu gelangen.

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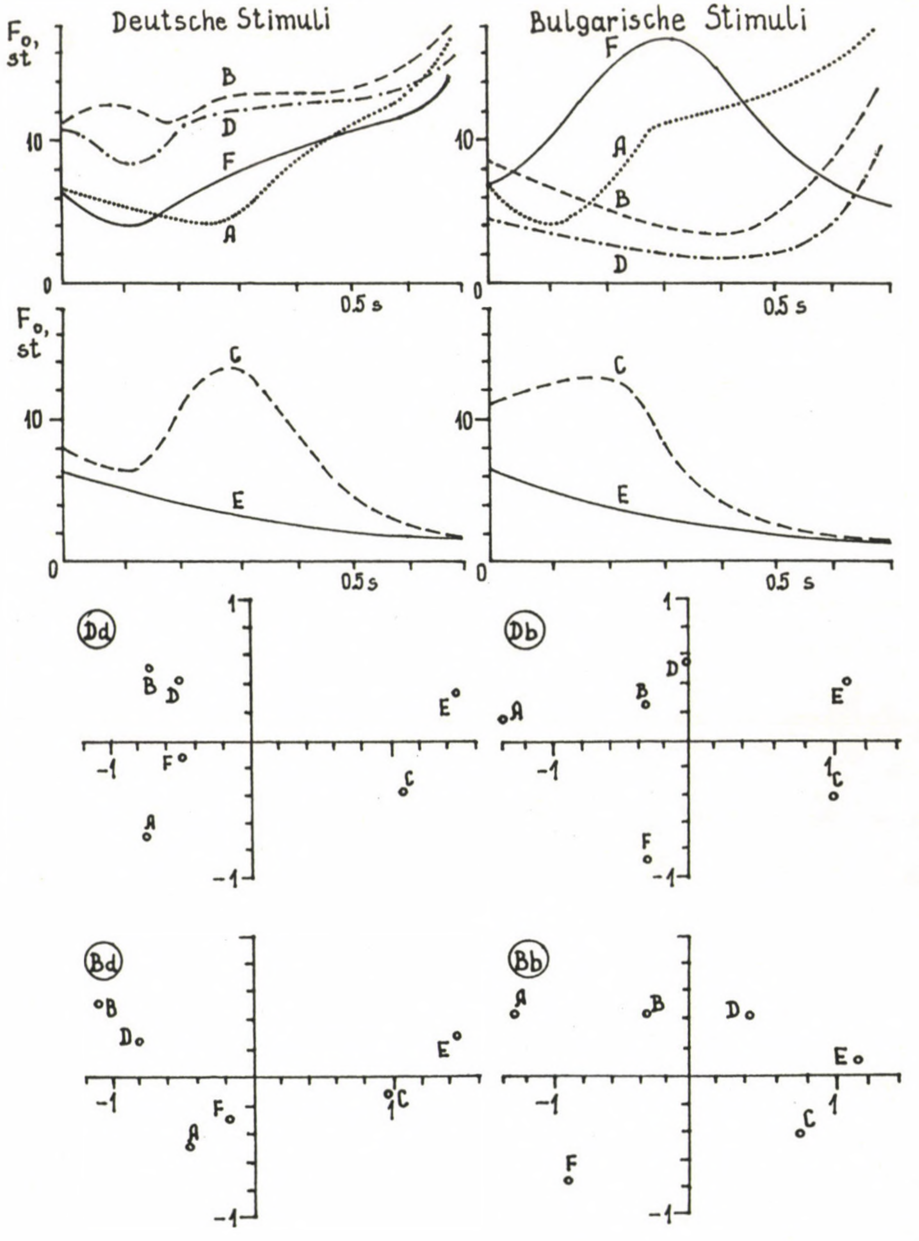

Abb. 1. Stilisierte Tonalkurven der deutschen und bulgarischen Stimuli und Resultate von MDS.

BEMERKUNGEN ZUR INTONATION DER ENTSCHEIDUNGSFRAGE IM UNGARISCHEN

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1. Die typische Satzmelodie der Entscheidungsfrage ohne Fragewort (Heben der Stimme bei der vorletzten, Senken bei der letzten Silbe) kann im Fragesatz wiederholt werden. Diese Eigenheit, die charakteristisch für die gesprochene Sprache ist, hat Bálint Csűry schon im Samoschgebiet beobachtet. Er unterscheidet drei Arten der zweigipfeligen Satzmelodie

a, Ein Teil des einfachen Satzes steht als Hinzufügung am Satzende.

b, Beide Teile des zuzammengesetzten Satzes sind Entscheidungsfragen.

c, Der Hauptsatz des Satzgefüges ist eine betonte Entscheidungsfrage und steht als Hinzufügung am Satzende.

Auch in dem Buch von Fónagy und Magdics finden sich Beispiele für die zweigipfelige (von ihnen zweihöckerige genannte) Satzmelodie. Sie stellen fest, dass die Frageintonation schon im vorbereitenden Teil erscheinen und -- oft mit kleinerem Intervall -- auf die Betonung am Satzende hinweisen kann. Im allgemeinen jedoch halten die Verfasser die zweigipfelige Satzmelodie eher für eine emotionale Intonation. Ihrer Meinung nach erhöht die Wiederholung der Frageintonation die Spannung des Satzes. Sie ist eine Begleiterscheinung des heftigen Argumentierens oder eine Folge des Grübelns. Auch grosse Überraschung, Unglaubigkeit, Unsicherheit, Ironie, Entrüstung, Nachdenken und Nachsinnen lassen sie mit der zweigipfeligen Satzmelodie wiedergeben. Weiterhin kann sie, in tieferer Lage, trauriges Abwinken ersetzen, und nicht zuletzt folgt auch die abwagende Frage diesem Muster.

Weitere Beispiele finden sich in der Zeitschrift Nyelvőr, aus der Pester Umgangssprache der 70-er Jahre, gesammelt von Rezső Boros.

2. In der ungarischen Umgangssprache der Gegenwart verbreitet sich die zweigipfelige Frageintonation immer mehr. Besonders häufig hört man sie in Reportagen und Gesprächen im Radio und im Fernsehen. Ich habe 200 Sätze mit zweigipfeliger (bzw. mehrgipfeliger) Satzmelodie aus der gesprochenen Sprache (aus Unterhaltungen, sowie aus Radio- und Fernsehreportagen) untersucht und versucht, sie einerseits zu sortieren, andererseits mit den von anderen Verfassern festgehaltenen Sätzen zu vergleichen. Die analysierten Sätze sind emotionell neutral.

Häufig ist die zweigipfelige Frageintonation in einfachen Entscheidungsfragen:

Volt vetélytársad a tévében?

In diesen steht ein betonter Teil (eine Hinzufügung, wie Csűry sagt) am Satzende. Heutzutage ist eine Beschleunigung des Informationsaustausches zu beobachten. Der

Reporter z. B. möchte in möglichst kurzer Zeit möglichst viel Information erhalten:

Te ilyen mama kedvence voltál mindig?

Aus anderen Beispielen ist zu erkennen, dass in der gesprochenen Sprache oft nach rechts, d. h. nachträglich, ergänzt wird. Der Reporter überlegt nämlich, während er fragt, und deshalb ist es eher akzeptabel, wenn er die Frage schrittweise formuliert, als wenn er Denkpausen einlegt:

Nem is akarod magadat megmutatni valakinek, teljesen?

Miért éppen ez a hét zeneműve? Hogy kicsit ismertté legyen erről az oldalról is?

Es kommt auch vor, dass der Sprechende die Frageintonation schon im betonten ersten Teil anwendet, um diesem so noch mehr Nachdruck zu verleihen:

Nem szeretnéd leszoktatni?

Fontos neked a népszerűség?

Die genannten Faktoren können manchmal auch zusammen auftreten, wodurch sie sich gegenseitig verstärken:

Maga részt vett ebben az égetésben?

In zuzammengesetzten Sätzen ist die zweigipfelige Frageintonation noch öfter gebräuchlich. Sie kommt nicht nur in der von Csűry behandelten Art von Sätzen (der Hauptsatz ist eine betonte Frage und steht am Satzende), sondern auch in anderen Formen häufig vor. Wenn der erste Gliedsatz der Hauptsatz ist, kann die charakteristische Betonung auch in nachgestellten Nebensatz wiederholt werden:

Hazamegy ma is, ha valami baja van?

Besonders häufig ist die Zweigipfeligkeit, wenn der nachgestellte Nebensatz lang ist:

A kerületi ingatlankezelésen múlik, hogy egy kerületben mennyi emeletráépítés van?

Nem fordulhat elő, hogy a fölszabdalt, fölbontott vasúti sinekből vasutat építettek valahol?

In diesen Beispielen hat der Nebensatz eine Länge von 16 bzw. 24 Silben. In solchen Fällen empfindet der Sprechende die seit der Anwendung der Frageintonation vergangene Zeitspanne als zu gross und hält deshalb eine Wiederholung für notwendig. Ausserdem wird die Frageintonation wiederholt, wenn Haupt- und Nebensatz durch eine Interjektion getrennt werden:

Boldogabb lennél - szerinted - ha zongoraművész lennél?

Ähnlich sieht der Satz aus, wenn nach dem Hauptsatz eine Anrede steht:

Jól értem, Gábor, hogy megismerhetetlenek vagyunk egymás számára?

Zweigipfeligkeit kommt sowohl in einfachen als auch in zusammengesetzten Sätzen vor:

Hallgassák csak Kulcsár Istvánt!

Und auch die abwägende Frage hat diesen Betonungsablauf:

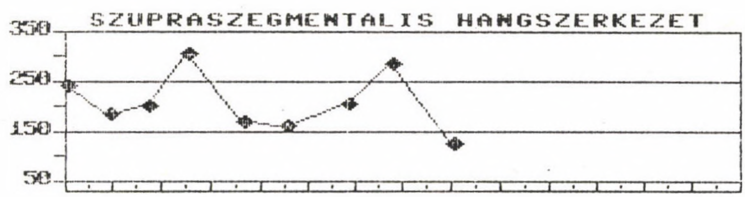
Nézd meg csak, hogy ez mennyi volt!

In einigen Fällen kommt die Frageintonation sogar dreimal vor, und zwar meistens in zusammengesetzten Sätzen, die in einem als betonte Hinzufügung formulierten Nebensatz enden:

Rögtön érezted, hogy te vagy a király a ligetben is?

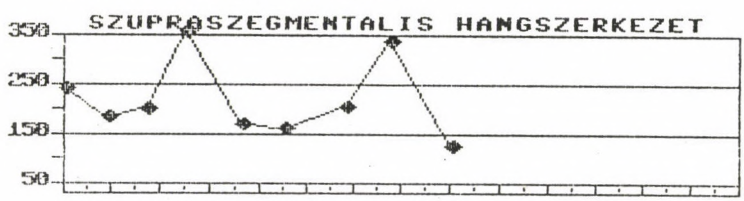
Obwohl man mit Recht sagen kann, dass die Anzahl der Fragesätze, in denen die Frageintonation innerhalb des Satzes wiederholt wird, ständig zunimmt, ist diese Erscheinung kein allgemeines, quasi verpflichtendes Betonungsmuster des gesprochenen Ungarisch der Gegenwart. Es gibt Sprecher, deren Fragesätze nahezu immer zweigipfelig (bzw. mehrgipfelig) sind, während andere diese Intonation überhaupt nicht gebrauchen.

3. Um feststellen zu können, bei welcher Art von Sätzen, bei welchen Informationsinhalten, diese Frageintonation allgemeingültig und wann sie lediglich eine individuelle Eigenart oder gar eine Manier ist, sind verschiedene Untersuchungen notwendig. Eine Möglichkeit stellt die Synthese mit dem Computer dar. Da das aus der gespochenen Sprache aufgenommene Textmaterial für die exakte technische Analyse nicht geeignet war, d. h. nur die Dauer genau messbar war, habe ich anhand durchschnittlicher Frequenzwerte -- die für die Entscheidungsfrage ohne Fragewort im Ungarischen charakteristisch sind -- eine einfache zweigipfelige Frageintonation konstruiert. Die Gipfel dieser synthetischen Satzmelodie haben eine Frequenz von 300 und 280 Hz.



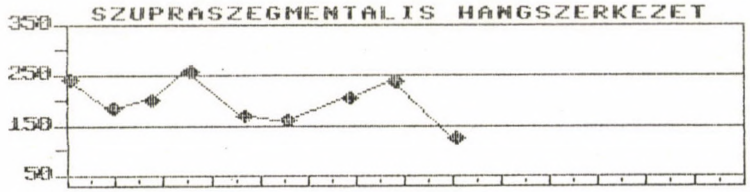
T:	0	180	340	500	720	900	1160	1350	1600
F:	236	180	196	300	164	154	200	280	120

Bei dem zweiten Beispiel habe ich die Grundfrequenz der Gipfel um jeweils 50 Hz erhöht, also einen ersten von 350 und einen zweiten von 330 Hz erhalten.



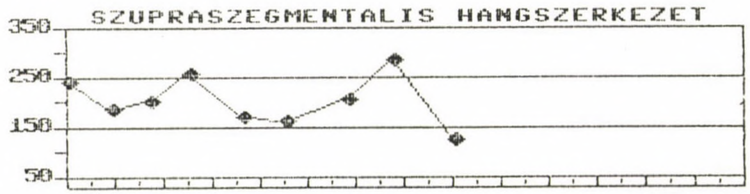
T:	0	180	340	500	720	900	1160	1350	1600
F:	236	180	196	350	164	154	200	330	120

Im dritten Beispiel habe ich die Gipfelfrequenzen -- im Vergleich zu den ursprünglichen -- um jeweils 50 Hz vermindert, also Gipfel von 250 und 230 Hz erhalten.



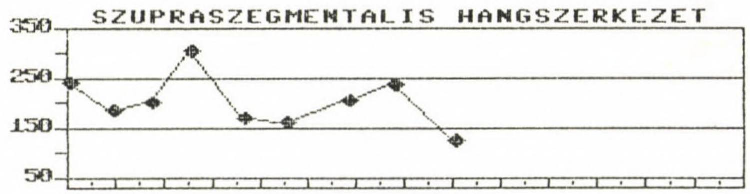
T:	0	180	340	500	720	900	1160	1350	1600
F:	236	180	196	250	164	154	200	230	120

Beim vierten Beispiel habe ich die Frequenz des ersten Gipfels um 50 Hz vermindert, die des zweiten jedoch bei 280 Hz belassen, so dass der erste Gipfel um 30 Hz kleiner wurde als der zweite.



T:	0	180	340	500	720	900	1160	1350	1600
F:	236	180	196	250	164	154	200	280	120

Im fünften Beispiel blieb die erste Gipfelfrequenz 300 Hz, während die zweite um 50 Hz vermindert wurde, wodurch die Differenz der beiden Gipfel auf 70 Hz anstieg.



T:	0	180	340	500	720	900	1160	1350	1600
F:	236	180	196	300	164	154	200	230	120

Die Dauer blieb bei dieser Änderung der Frequenzwerte gleich.

Die per Computer produzierten Intonationsmuster habe ich im Rahmen eines Experiments 30 Studenten vorgespielt, um so die Beantwortung folgender Fragen zu erleichtern: a, Wie apperzipieren die Versuchspersonen die Veränderungen der Satzmelodie, die Tonlage, den Tonumfang und die Intervalle? b, Wie verhalten sich Satzmelodie und eingesetzter Inhalt sowie Produktion und Perzeption zueinander?

Die Versuchspersonen wurden aufgefordert, die gehörten

Satzmelodien in dem vorher angefertigten, drei verschiedene Tonlagen darstellenden Liniensystem, auf dem Testblatt festzuhalten, der aufgezeichneten Intonation entsprechenden sprachlichen Inhalt einzusetzen und schliesslich festzustellen, was für eine Mitteilung die gehörte Melodie ausdrückt.

Die Darstellung der Satzmelodie ist sehr gut gelungen. Alle 30 Studenten haben auswertbare Abbildungen geliefert.

27 Studenten (90%) haben in allen fünf Fällen bemerkt, dass zwei Betonungsgipfel vorliegen.

Die Wahrnehmung der Unterschiede zwischen den Gipfelfrequenzen war schon schwieriger. Relativ leicht waren hier Muster eins und vier. Das erste haben 22 Studenten (73%), das zweite und dritte jeweils 15 (50%), das vierte 20 (67%), und das fünfte haben 16 Studenten (53%) annähernd richtig aufgezeichnet.

Da auf drei Testblättern lediglich die Satzmelodie dargestellt wurde, konnten für die weitere Auswertung nur 27 Testblätter verwendet werden.

Das erste Muster halten 19 Studenten (70%) für eine Frage und 8 (30%) für eine andere Satzart. Die Zweite Melodie halten ebenfalls 19 Studenten für eine Frage. Das dritte Muster werten nur 6 Versuchspersonen (22%) als Frage. 17 (63%) werten es als Aussagesatz, eine als Ausrufesatz und eine als Aufforderung, Gejammer und Meditation. In der vierten Melodie erkennen wieder (wie in den ersten beiden) 19 Studenten (70%) eine Frage und 8 (30%) eine andere Satzart. Die fünfte Melodie halten 16 Versuchspersonen (59%) für eine Frage, 11 (41%) für andere Satzarten.

In der Fällen, wo eine oder beide Gipfelfrequenzen relativ gross sind, meinen viele Versuchspersonen -- selbst in den Intonationsmustern ohne Klangfarbe und Dynamik -- starke Emotion und Erregtheit zu hören. Dies zeigt sich in den eingesetzten Inhalten sowie in den Bewertungen, zu denen ich sie nicht einmal aufgefordert hatte. Dies gilt besonders für das zweite Muster. 59% Versuchspersonen dieses zweite Muster für emotionell angereichert. Die erste Melodie empfinden weniger Studenten als emotionell (33%). Die vierte Melodie empfinden noch weniger Studenten als emotionell (30%). In der dritten Melodie hören 15%, in der fünften Melodie nur 7% ein emotionales Plus.

4. Zuzammenfassend kann man feststellen, dass das Experiment zeigt, dass die Versuchspersonen die Zweigipfelige Satzmelodie als Frageintonation empfinden, wenn die Frequenz der Betonungsgipfel um die 300 Hz beträgt, unabhängig davon, ob der erste oder der zweite Gipfel um 30 Hz erhöht wurde. Das erste, das zweite und das vierte Muster halten jeweils 70% für eine Frage. Wenn die Frequenzwerte der Intonationsgipfel etwas niedriger sind, empfinden das Muster schon weniger Versuchspersonen (59%) als Frage, und wenn sie noch niedriger sind, erkennen in der Melodie nur 22% eine Frage.

Bei höheren Gipfelfrequenzen sprechen dem Muster mehr Studenten eine emotionelle Ausdruckskraft zu. Als emotional werden besonders die Melodien empfunden, in denen die Frequenz des zweiten Intonationsgipfels relativ hoch ist. Diese Beobachtungen sind im Einklang mit den Untersuchungsergebnissen von Mária Gósy, d. h. bei der Perzeption wirken vor allem Intonationsformen mit hoher Frequenz und solche mit steilem Anstieg bzw. Abfall expressiv.

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ARTICULATORY MODELING OF POLISH NASAL SOUNDS.

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1. Introduction.

In the paper a simulation model of the vocal organ is presented. The model has been programmed in Turbo Pascal for an IBM PC computer. With the use of this model as research tool the possibilities of analysing the formant structure of the speech signal has been demonstrated in the static states for the cases of oral and nasalized vowel and nasal consonants.

2. The bases of articulatory modelling .

The main parts, of the vocal tract are three cavities: pharyngeal, oral and nasal. Their current configuration during articulation, depends on: a) the position of the soft palate, b) the position and the type of the exciting source. Considerable part of the surface of pharyngeal-oral tract walls is formed by the moving articulators of the speech organ: tongue, soft palate, lips and jaw. Hence, the geometrical configuration, i.e the shape, length and velum of the pharyngeal-oral tract is subject to considerable variations during the articulation process. The geometry of the nasal part is constant with the exception of the inlet formed between the uvula and the back wall of the nasal tract (about of 3 cm length). Therefore, large simplifications can be done considering the shape function of the cross-sectional area of this tract by treating the segments of the nasal channel as one tube of the cross-section equal to the sum of their cross-sections and by approximating the irregular shapes of the cross-sections by an appropriate circular shape. Similarly, the pharyngeal-oral tract has been represented as a tube with the stepwise variable circular cross-section, constant with in the range of subsequent segments.

The basic problem in modelling the voice generating and articulating functions of the speech organ is to determine the transmittance function T(f) of the vocal tract, i.e the ratio of the volume velocities or acoustic pressure at the mouth and/or nasal and at the glottal openings. The widely applied principle of analog modelling of the vocal tract consists in representing the system as a tube with stepwise variable cross-sectional area, partitioned into finite number of elementary segments. Every elementary segments of a cylindrical tube of the lenght l and cross-section A is treated as a lumped-parameter system in a form of an equivalent electrical system, e.g. a four-terminal network. This network is described to the unit parameters of an acoustic tube, i.e the acoustic innertance, acoustic compliance, friction loss resistance and heat lost conductance. Acoustic impedance of the laryngeal source and the acoustic radiation impedance of this openings of mouth and nostrils are replaced by equivalent two-terminal networks [1].

Calculation of the spectrum of an acoustic signal in the case of two tracts being active was carried out as follows. The acoustic pressure transmittance was calculated as a superposition of the outputs of two tracts:

a) with the input admittance of the nasal tract Y_n, shunting the pharyngeal-oral, connected in the branching point (Fig. 1a), and

b) with the input admittance of the oral tract Y_u, which shunts the pharyngeal-nasal tract, connected in the branching point (Fig. 1b).

Such approach simplifies significantly the calculations and permits to analyse directly the mutual interaction between oral and nasal parts at the branching point of the vocal tract.

2. Verification of the model.

The numerical model of the vocal tract has been verified for the phonetic data of the Polish language. The radii of cross-sections of subsequent tract segments were the input data for the program. As a starting point the data concerning pharyngeal-oral tract given by Mrayati[2] were used. These among the eleven French vowels have been chosen which are the closest to the Polish ones from the acoustic and phonetical point of view, and their articulatory cross-sections have been used for further analysis. In this way, cross-section functions of six Polish vowels have been chosen. Additionally, they have been compared with the cineradiograms and with the data available in the atlas of the sounds of Polish language elaborated by the phoneticians from Hungarian Academy of Sciences [3]. With the obtained articulatory data the following functions have been calculated: the transmittance functions, frequencies of the formants F1, F2, F3 and corresponding formant band width B1, B2, B3 of the considered vowels.

3. The study of nasalization

With the use of the developed model the influence of the phenomenon of nasalization on the spectral structure of the investigated vowels has been studied. Flexibility of the model makes it possible to simulate the types of configuration which differ with each other in an arbitrary way and in consequence give significantly different formant structure.

Studies on the influence of configuration changes on the transmittance functions have been carried out with the following assumption: a) the point of connection of the nasal tract to the pharyngeal-oral tract have been constant for all cases, b) the acoustic coupling between tracks expressed by the cross-sectional radius of the first segment of nasal tract, has been variable. In the subsequent simulations the radius was assigned the values r_1=0.001, 0.2, 0.5, 1.0, 1.4 cm, c) the pharyngeal-oral tract articulation configuration has been variable (Fig.2). The influence of nasalization on the spectral structure of investigated speech sounds is closely related to their place articulation. Tongue shape and position in the oral cavity decides about the degree of change of the formant structure of the considered vowels as a result of increasing acoustic coupling between the oral and nasal tracts. The influence of the nasalization process is noticeable earlier for the front vowels than for the central and back ones. The results of the formant structure analysis of nasalized vowels can be of great importance in the studies on the phenomenon of coarticulation and of the influence of nasal consonants pronounced in sequence with oral vowels.

The next step of model verification was the analysis of nasal consonants. The formant frequencies for approximate articulatory cross-sections of the pharyngeal-oral tract which correspond to the shape of articulation of the analysed nasal have been calculated. A mean coupling of nasal and oral part, to which corresponded the nasal inlet radius r_1=0.7 cm have been accepted. The configuration of the oral cavity has been found with the method of successive approximations according to the criterion of the frequency characteristic conformity in respect of the displacement of poles and zeros which concerned the nasal consonants articulation and their formant frequencies. In order to find an approximate oral tract configuration during the pronunciation of nasal consonants, an analysis of the influence of the oral tract lenght on the displacement of poles and zeros for a constant average acoustic inter-tract coupling has been carried out. An example of consonant /m/ modelling is given in fig.3.

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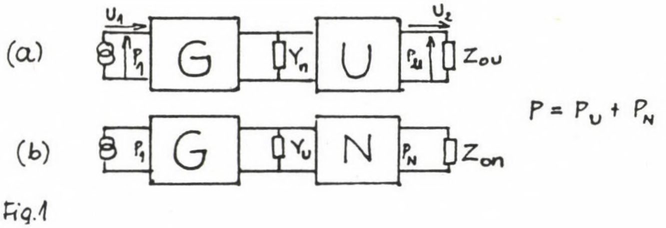
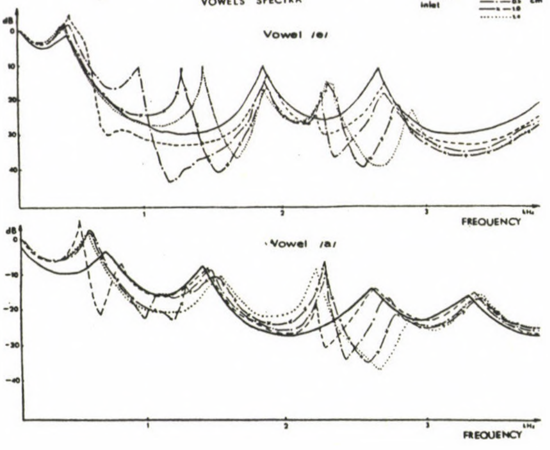


Fig.1

Fig.2 THE EFFECT OF NASALIZATION ON VOWELS' SPECTRA



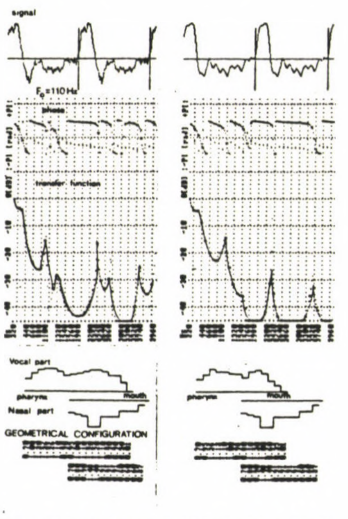


Fig.3 ACOUSTICAL MODELLING OF THE VOCAL TRACT

THE FUNDAMENTAL FREQUENCY CONTOUR SHAPE AS AN IMPORTANT PARAMETER IN VIETNAMESE WORD RECOGNITION

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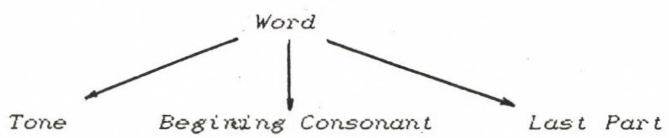
1. Introduction

This paper gives a short description of the vietnamese language, which is one of "tone" languages in the world. The Vietnamese words always consist of one syllable. Every word has a tone. So the vietnamese words are easily recognized in the human speech processing. Six tones can be distinguished from each other. They determine the height, lenght, rhythm, and melody of a word.

a. **Neutral tone :** continuously high. Not marked.
b. **Falling tone :** goes from high to low. Symbol: \ .
c. **Rising tone :** goes from low to high. Symbol: / .
d. **Question tone :** first goes from high to low, then again to high. Symbol: ? .
e. **Stumbling tone :** goes from low to high, then falls back and lastly rises again. Symbol: ~ .
f. **Hard tone :** falls from high to low, and suddenly stops. Symbol: • .

The meaning of a word is changed by adding one of the above mentioned symbols. For example:
<u>Ta</u>: we; <u>Tà</u>: antipathetic; <u>Tá</u>: dozen; <u>Tả</u>: right(-hand) side, tiphus; <u>Tã</u>: baby's napkin; <u>Tạ</u>: two hundred weight, dumb-bell.

A vietnamese word consists of three parts:



In Table 1 the relations of them are given.
Where (1): the beginning consonants,
(2): the tones,
(3): the last parts.

Every beginning consonant can stand before every last part, but not all last parts have six tones

2. Recognition of tone in Vietnamese.

According to above descriptions the importance and the necessity of the tone in Vietnamese is evident. In this part a speech analysis system, which is based on the **VERBIDENT-SD-2** Izolated Word Speech analysis system [4] will be described. In this system the intonation extraction is done in quasi real-time. The speech analysis is performed on the IBM-PC (XT or AT) Personnal Computer provided with a digital signal card in the hardware. This card containing a TMS 32010 processor is used for universal digital signal processing. Thus, we can use this card for the Speech recognition, Speech synthesis, or the Speech coding e.t.c. The high speed of the processor makes in practice the real-time solution of the problems to be enable.

(1)	(2)	(3)											
		a	ăm	ây	e	ê	i	y	o	ô	ơ	u	ư
		ai	ăn	âm	em	êm	ia	yêm	oa	ôi	ơi	ua	ưa
sima	NEUT.	ay	ăng	ân	en	ên	iem	yên	oai	ôm	ơm	uay	ưi
b		am		âng	eng	êng	ien	yêu	oay	ôn	ơn	uan	ươi
c		an		âu	eo	ênh	ieng		oam	ông		uang	ươm
ch	\	ang			eu		im		oan			ue	ươn
d		anh					in		oang			uê	ương
d		ao					inh		oanh			ui	ưn
g	/	au					ieu		oao			uy	ưng
gi							iu		oăm			uya	ưu
gh									oăn			uyu	ươu
h	?								oăng			uyên	
k									oe			uynh	
kh									oen			uôi	
l	~								oeo			uôm	
m									oi			uôn	
n									om			uông	
nh	•								on			uơ	
ng									ong			um	
p												un	
ph												ung	
q		ac	ăc	âc	ec	êch	ich	yêt	oc	ôc	ơt	uc	ưc
r		at	ăt	ât	et	êt	it		ot	ôt	ơp	ut	ưt
s		ap	ăp	âp	ep	êp	ip		op	ôp		up	ưp
t	/	ach					iec		oac			uôc	ươc
th							iet		oat			uôt	ươt
tr							iep		oap			uât	ươp
x	•								oach			uêch	
									oăc			uyêt	
									oăt			uych	
									oet			uyt	

Table 1

In the software the system contains a program, with the help of which we get necessary parameters of the speech, among them the tone one, too.

The signal processing is carried out by a digital signal processing card pluged into a IBM-PC computer, operating with TMS 32010 processor. This process is shown in Figure 1, without regarding to that if the given function is realized in hardware or software.

The speech signal coming from microphone is filtered by a (0-3,7 KHz) input low-pass filter (1-th block) and then goes to the (2) Analog-Digital Converter (ADC). The ADC converts the samples, which are given on 10 KHz sampling frequency, to 12 bit, 2-complement codes. In the next steps in 10 branches the

$(3_i - 5_i)$ blocks realizing the bandpass filter function process the samples of the speech signal. The mean value of the signal is generated by the 7-th block in the window 15 ms (150 samples). The 8-th and 9-th blocks guarantee the function of the start-end word detection. The 8-th block forms the sum of 10 mean values in each 15 ms. The 9-th block detects the start of the word, if the sum energy of the segment exceeds the mean noise level, at least 6 decibel. It detects the end of the word, if the sum energy through 20 segments is less than (the noise level + 3) decibel.

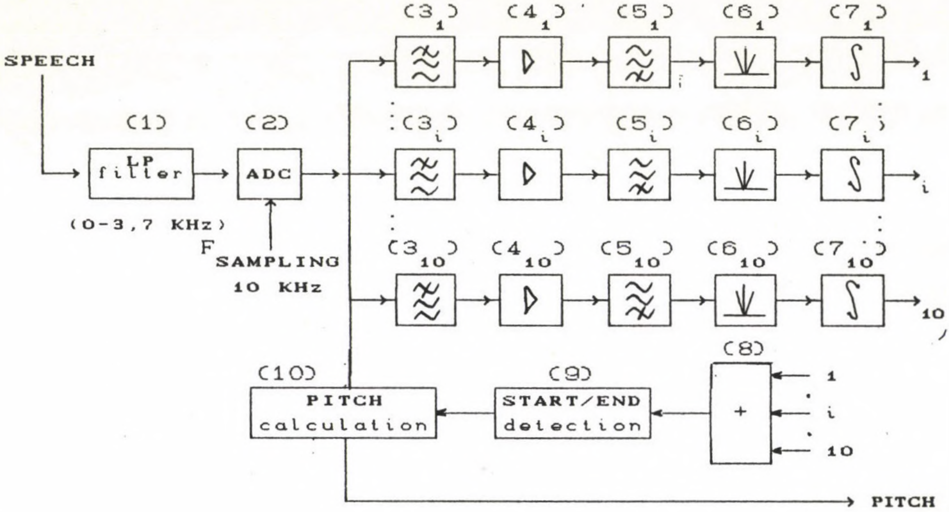


Figure 1. The analysis algorithm.

The program between the start and end positions determines the pitch value for each segment having the 5 ms duration. In this paper we apply a simple so-called FAMDF (Forward Average Magnitude Difference Function) which has the form ([1], [2] and [5]):

$$A_{(j,N,T)} = \frac{1}{N} \sum_{i=j}^{j+N-1} | s(i+T)-s(i) |$$

where s(i) is the i-th sample

j indicates the j-th examined segment

N is the sample number of segments

We divide the spoken sound into segments of approx. 10-20 ms. We place the samples into a so-called "cyclic" buffer in the program RAM memory of the TMS processor. The cyclic buffer can be seen in the Figure 2.

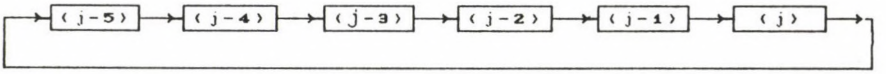


Figure 2. The cyclic buffer.

For example, when we compute the pitch value of the (j-5)-th segment, new 50 samples are placed from the j-th segment. When applying the FAMDF we do not have to move all the samples of the segment, but only those which are in the so-called AMDF window. The AMDF window is defined as follows: we firstly find the sample having the maximal absolute value of the examined segment. After that we place it into the window together with 20 samples on each its right and left hand side, and we now apply the FAMDF formula. The estimation of the pitch value can be done by using the minimal values of the AMDF. Here we determine the pitch value based on least three minima.

3. The further research

In the experiments we draw the picture of 6 tones (see Fig. 3). Based on this we already can decide what tone the spoken vietnamese word has ? Therefore, in the recognition of a vietnamese word the tone can be considered as an important parameter [5].

In our further research we try to place this parameter into the recognition algorithm in the hope that this parameter provides a base for the ability of the system in the recognition of vietnamese words.

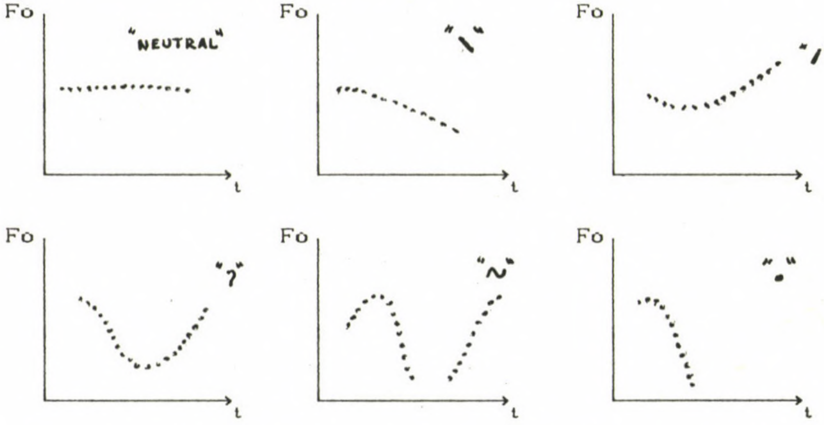


Figure 3. The fundamental frequency contour shapes of six tones.

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METRICAL DIACHRONY AND THE <u>JER</u>-SHIFT IN CZECH

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"The loss vs. vocalization of the jers illustrates a purely rhythmical movement in Slavic in disregard of the place of the accent and determined by the word boundary."
--- Galton (1983: 50)

Handout

I. Since the advent of metrical theory in Liberman and Prince 1977, it has been applied with conspicuous success to the synchronic descriptions of an impressive number of languages (cf. Hayes 1980). The diachrony of metrical systems, on the other hand, has received considerably less theoretically devoted attention in the literature. The central conviction of this study is that a theory of metrical change grounded in the parameters otherwise needed for synchronic systems would be a desirable goal. The present paper takes a small step towards this goal by examining the crucial chapter in the metrical history of Czech, a West Slavic language, as it developed from Late Common Slavic (LCS). For present purposes I will assume the essential correctness of the arboreal theory of stress (cf. Hayes 1980).

A central hypothesis of this study is that the loss and lowering of the LCS high lax vowels known as <u>jers</u> in Czech was a foot-based rule. This historical event will be called the '<u>jer</u>-shift' (after Isačenko 1970), and I contend that it was inextricably connected to the restructuring of the LCS metrical system in Czech. Claiming that the <u>jer</u>-shift was a rule sensitive to metrical feet automatically relates this phenomenon to the question of stress placement. This relation is not intrinsically achieved when the <u>jer</u>-shift is analyzed as an iterative segmental rule (Kučera 1975), and the claim that there is any relation at all between the two goes against certain traditional Czech grammarians such as Trávníček 1924 who asserts that the two matters were independent.

II. Modern Czech word stress. Czech has a fixed initial main stress which is dynamic as opposed to tonal (or 'pitch-accent'-like) in nature. Secondary stresses alternate on the following odd syllables. A final odd syllable may remain unstressed (subject to rate of speech and accentual context). (The acute '´' in written Czech designates length and not stress.) Formalizing this:

(1)
s w — voda 'water'
s w — platím 'I pay'
s w — dílna 'workshop'

seskočit / seskočit 'to jump off' kázání / kázání 'sermon'

nařízení 'regulation' dovolená 'holiday'

ustanovení / ustanovení 'provision'

nesnesitelná / nesnesitelná 'unbearable'

po velikonocích 'after Easter' (stressed proclitic 'po')

(2) a. Build binary left-dominant feet left to right, optionally building a word-final strong degenerate foot.
b. Stray adjoin any remaining syllable (to its left).
c. Build a left-dominant word tree.

(3) červeno-bílý 'red-white' NOT: * červeno-bílý

(4) Characteristics of the LCS accentual system:

a. At most one phonemic accent (= H(igh) tone) per word.
b. Any long syllable and word-final short syllable could carry the accent.
c. Syllables preceding the accent were redundantly H.
d. Syllables following the accent were redundantly L(ow).
e. If no phonemic accent, then initial syllable is HL ('falling') by default.

(5) More formally: [σ σ̄ σ σ̄] underlying form

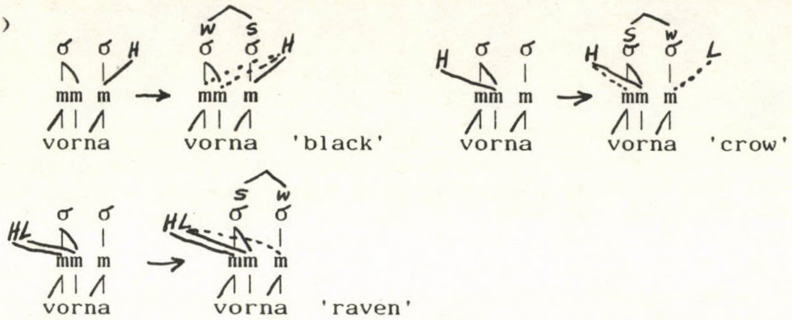
[σ σ̄ σ σ̄] spread H left (or default HL insertion)

[σ σ̄ σ σ̄] default L insertion and spread right

(6) jāgoda 'strawberry' dārovāti 'to present'

bergъ 'shore' mālīna 'raspberry'

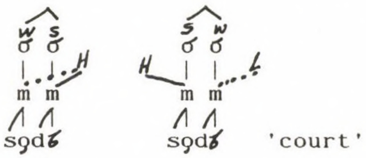
(7)



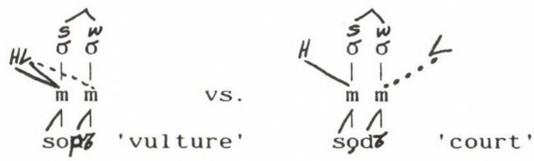
(8) tense: i y u lax: ь ъ (jers) < ĭ, ŭ
ę ǫ e o
ě a

(where /y/ = /ɨ/; after denasalization: ę, ǫ > ě, u)

(9) LCS:



(10)



(11) LCS pitch became interpreted in terms of quantity:
sup 'vulture' ; soud 'court' (Mod. Czech forms)

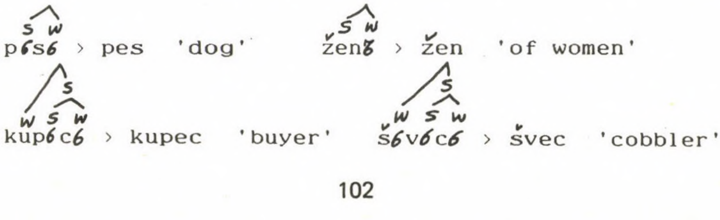
(12) a. Build binary left-dominant feet from right to left.
b. Stray adjoin any remaining syllable.
c. Constraint on foot construction:

* s w
ь,ъ V (where V is any non-<u>jer</u> vowel)

(13) a. Foot-based <u>jer</u> deletion: m | [+high] ---> Ø / ___ (w)

b. Elsewhere m | [+high] ---> /e/.

(14)



s w s w
kupьčьkъ › kupček 'buyer (dim.)'

s
s w w
okъno › okno 'window'

s w s w
sъbьrati › sebrati 'to gather'

s
* w s w
okъno

s
s w w
vъzьmu › vezmu 'I will take'

s
w s w
vъzeti › OCz. vzieti 'to take'

s w s w
sъ pьsъmь › se psem 'with the dog'

s
w s w
dьnьsь › dnes 'today' (from <u>dьnь</u> <u>sь</u> 'day this')

s
w s w s w
sъ šьvьcьmь › s ševcem 'with the cobbler'

s
s
w w s w
vъ kostьchъ › v kostech 'in the bones'

(15) a. pitch loss (10th century)
b. <u>jer</u>-shift (10th century)
c. stabilization of fixed initial stress (12th century)

(16) Stress shifts (LCS --> Czech)

s s w w mъlinъ HL	'mill'	new foot construction --> (no neoacute retraction, but stress shift)	s w s w mъlinь HL	pitch loss & jer-shift -->	MCz. mlýn (generalization of initial stress)
s w w s konъcъ H	'end'	new foot construction --> neoacute retraction	s w s w konъcъ H L	pitch loss & jer-shift -->	s w MCz. konec (cf. Russian 'konéc')

According to Shevelov (1964: 445):
(a) The first of two jers preserved its stressability.
(b) Stress was not shifted over a syllable.
(c) Nor was stress shifted from a jer onto the following jer.
(d) A single jer preceded by a non-jer vowel shifted its stress onto this vowel.
(e) A single jer not preceded but followed by a non-jer vowel shifted its stress onto this vowel.

SPEECH SOUNDS NORMALIZATION

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Abstract

Assuming, that each sound undergoes the same normalizing procedure, it can be shown that most of the speech sounds and normalization methods - as yet tried - can be presented as specific cases of a more general approach. The cases are shown as results of some constraints placed on speech production rules. They are called 'first type constraints'. A choice of the particular normalizing rule is also connected with the acceptance of the 'second type constraints'.

Several approaches to the speech sounds-normalization problem in the domain of frequency were judged on the basis of vowels formant frequencies measurements. In the end, a dynamic time and frequency warping is suggested, not only for evaluation of different normalizing methods but for investigations deciding about possibilities of normalization as well.

Introduction

Acoustic features are to such a great extent speaker-dependant that we can recognize people by their voices. This fact is a hindrance to automatic speech recognition.

We divide here the sources of speech sounds variability according to their origination -roughly speaking - into two classes: into the class of intraspeaker origination and into the class of interspeaker origination. The intraspeaker variability can be regarded as a result of the inaccuracy of articulation, while the interspeaker variability can be regarded as resulting from differentiation in the vocal tract anatomy. A procedure aimed at reduction of the variability of acoustical features is called **normalization**. To our mind, it should be assumed that each sound undergoes the same normalizing procedure and that any classification is performed in the next successive stages of acoustic signal processing.

In this study we present purely formal considerations showing when it is possible to eliminate or to at least decrease an influence of one factor or the common influences of several factors. We consider the observed speech sounds as realizations of patterns converted by means of some transformations with one or more degrees of freedom. The degrees of freedom result from *a priori* assumed constraints equations. Such an approach reveals us how up untill now applied methods can work, and allows us to show them as a particular cases of a more general rule.

Preliminary assumptions

Our considerations are based on the following assumptions:

1. A speech signal's acoustic features are affected by two factors - *A* and *B*. The factor *A* influence results in the coding of an information, whereas we can observe results of the factor *B* influence as inter- and intraspeaker variability. The factor *B* effects include in our approach also influences of the environment where the sound wave propagate.

2. All sounds, without exceptions, undergo the same preliminary normalization while perception, which consists in determining invariants of the *B* factor influences.

3. The *B* factor influence undergo some limits, which prevent e.g. generating identical speech sounds as a realizations of different patterns.

It follows from the second assumption that no sounds undergo any prior classification before normalization. The different, *a priori* admitted assumptions about the limits which the factor *B* influences undergo are a basis for the construction of a variety of normalization procedures.These limits we will call **first type constraints.** The existence of these limits is a precondition for correct speech-sounds recognition.

Model

To form the model, we start out from approximating the factor *B* affection with a power series. Such an approach allows us to introduce the 1-st type constraints through limits imposed on the power series coefficients variability. In particular we will equate them to 0 or 1. The coefficients, which will keep their variability in some continuos range of values, will be called **free coefficients** and their number - the **number of degrees of freedom.** The normalization will therefore resolve itself into elimination of the free coefficients.

Let us assume that the factor *A* can take some limited number of levels, which we will denote with the index i. We will assume about the *B* factor that it can take an unlimited number of levels which we will denote with the index j. Let us ascribe to the levels of the *A* factor some feature vectors X_i with components $x_{ik}=x_{i1},\ldots,x_{ik}$. Let $X_m \neq X_n$ for any $m \neq n$. We will call the X_i vectors **characteristic vectors**. Vectors obtained as a result of the affection of the factor *B* on a characteristic vector X_i we will denote by Y_{ij}. Their components will be $y_{ijk}=y_{ij1},\ldots y_{ijK}$.

Let x_{ik} be a features measured in the same units (e.g. let they be formant frequencies expressed in Hz). The affection of the *B* factor having taken j-th level on the X_i vector components can be approximated under this condition with a power series

(1) $$y_{ijk}=\sum_{l=0}^{\infty} b_{jl}x_{ik}^{l}.$$

We will call this transformation the **production rule**. Assuming that the constraints are expressed by the equations

(2) $$b_{jm}\neq 0 \text{ for some } m\neq 0 \text{ and } b_{jl}=0 \text{ for every } l\neq m$$

exists, we get a production rule with one degree of freedom

(3) $$y_{ijk}=b_{jm}x_{ik}^{m} .$$

The free coefficient b_{jm} can be in this case eliminated with a transformation

(4) $$\hat{y}_{ijk}=\frac{y_{ijk}}{\bar{y}_{ij.}} ,$$

where $\bar{y}_{ij.}$ denotes either the arithmetic, weighted mean value $(\sum_{k=1}^{K} w_k)^{-1}\sum_{k=1}^{K} y_{ijk}w_k$ or the geometric one, ie. $(\prod_{k=1}^{K} y_{ijk}^{w_k})^{1/W}$, where $W=\prod_{k=1}^{K} w_k$. It can be seen after substituting (3) to (4), i.e:

$$\hat{y}_{ijk} = \frac{b_{jm}\, x_{ik}^{m}}{(\sum_k w_k)^{-1} \sum_k b_{jm}\, x_{ik}^{m}\, w_k} = \frac{x_{ik}^{m}}{(\sum_k w_k)^{-1} \sum_k x_{ik}^{m}\, w_k} .$$

We will say that transformation (4) eliminates one free coefficient of the multiplicative character. Assuming existence of the constraints of the form

(5) $$b_{jm}=1 \text{ for some } m,\quad b_{j0}\neq 0 \text{ and } b_{jl}=0 \text{ for every } l\neq m \text{ and } m\neq 0$$

we get another production rule with 1 degree of freedom. It is

(6) $$y_{ijk} = x_{ik}^{m} + b_{j0}.$$

The free coefficient b_{j0} of the additive character can be gotten rid off with the following transformation

(7) $$\hat{y}_{ijk} = y_{ijk} - \bar{y}_{ij.},$$

where $\bar{y}_{ij.}$ is the arithmetic, weighted mean value.

Analogously, we can find another production rules with one degree of freedom. Making assumptions like $b_{j0}=\alpha b_{jm}$ or $b_{jm}=\alpha b_{j0}$, where α is a previously known constant, we can also apply the formula (4) to reject the free coefficient.

Assuming the following constraint equations

(8) $b_{j0} \neq 0$ and $b_{jm} \neq 0$ for some m and $b_{jl}=0$ for the remaining m we obtain a weaker constrained production rule with 2 degrees of freedom

(9) $$y_{ijk} = b_{j0} + b_{jm} x^{m}_{ik} .$$

We get rid of the free coefficients b_{j0} and b_{jm} with the transformation

(10) $$\hat{y}_{ijk} = \frac{y_{ijk} - \overline{y}_{ij.}}{\sigma_{ij.}} ,$$

where $\sigma_{ij.}$ denotes standard deviation, $\sigma_{ij.} = W^{-1} \sum_{r} [x^{m}_{ir} - \overline{y}_{ij.}]^{2}$ with reference to the arithmetic weigthed mean value; $W = (\sum_{r} w_{r})$.

Second type constraints.

Equations which evaluate weights and equations which defines forms of averaging are also certain kinds of restrictions. They decide which features - in case of weak consistency with reality or when errors occur - should play a greater role in the normalization process. The constraints will be called a **second type constraints**. For example, arithmetic averaging does not discriminate features with respect to their values, whereas the geometric one does.

Interpretation of the different normalizing rules known from literature.

Making use of the approach presented here, we can show two normalizing procedures known from literature as particular cases of the rule (4) or (10) (see [4] for reviev).

1. Miller [2] normalized vowel formant frequencies according to the formula $F_k = \log F_k - \frac{1}{3} \log (F_1 * F_2 * F_3)$, which is equivalent - as far as the normalizing effect is concerned - to the formula $F_k = (F_1 * F_2 * F_3)^{-1/3} * F_k$.

This is a rule analogous to (4), which eliminates one free coefficient of a multiplicative character. The proper production rule in this case is also of the form (3), where index i will be interpreted as a vowel number, index j - as a realisation number and index k as a formant number.

Each of the formant frequencies was taken here with equal weights i.e. $w_1 = w_2 = w_3 = 1$, but the geometric averaging applied here raises significance of the lower formants.

3. The rule applied by Pister-Bourjot [3] resolves itself into a formula of the form (10). The energy values from the outputs of a 16-filter bank frequency analyser providing the short-term spectrum were taken as a features of the speech signal there . The rule was

$$ECR(i) = [E(i) - EM]/S,$$

where $E(i)$ was the mean energy in the 13 lowest frequency filters $EM = \frac{1}{13} \sum_{k=1}^{13} E(k)$, S was the standard deviation of the energy in the 13 filters. The method normalizes the acoustic frequency spectrum in the amplitude domain. It identifies contours which can be brought forward to identity with a linear transformations.

Experiment

Method

Seeking the most effective method for speech-sounds normalization in the frequency domain, I have examined the effects of vowels formants normalization according to four rules. They were:

(1) $F'_i = (F_i - \bar{F})/\sigma_F$ (abbrev. STAND),

(2) $F'_i = F_i/\bar{F}$ (abbrev. AMV),

(3) $F'_i = F_i/\bar{F}^G$ (abbrev. GMV) and

(4) $F'_i = F_i - \bar{F}$ (abbrev. BARK),

where i denotes the formant's number, F - frequency, σ stands for standard deviation, $\bar{F}$ - for the arithmetic mean value and $\bar{F}^G$ for the geometrical mean one. In the 4-th approach formant frequencies were converted to barks.

As a test criterion I have employed the mean values of the Mahalanobis distance (MMD) in the shortest dendrite, connecting points marked in the normalized feature's space by their mean values. I have calculated the MMD for the formant frequencies of 6 Polish vowels (A.P.) which were spoken 5 times by 18 men and 12 women in isolation at first. I have performed the same calculations for Peterson&Barney's (P.&B.) and for Leonard's (R.G.L.) [5] data, which concerned American-English vowels. In this case, however, I had at my disposal only the mean values of the origial quantities averaged over men, women and children separately.

Results

The results of the calculations are shown in the table. Also given are the MMDs for unnormalized formant frequencies expressed in Hz (NT), in barks (BARK0) and for their logarithms (i.e. for $log_e(F_i[Hz])$). Additional computations showed us that differences between the MMD values for the unnormalized features issued from the assymetry of the density of probability of the formant frequencies. All weights were equal to 1.

Conclusions

1. The best results provide us normalization when geometric mean value was applied. This approach is equivalent to the Miller's one.

2. Normalization of the formant frequencies expressed in barks makes intervowel contrasts worse (when comparing MMD values of BARK with the ones of BARK0).

3. One should not expect very significant effects of the normalization of speech sounds in the frequency domain.

The theoretical considerations exhibit that - in cases when no prior classification can be assumed - the normalization will decrease intersounds contrasts issued not only from interpersonal differences but from differences issued from different place of articulation as well.

Situations were considered here, where normalizing rules - and what is more - also production rules were *a priori* assumed. A real function transforming one sound into another can be revealed by means of the dynamic time and frequency warping method (in [1]). At first the time differences should be removed ('the dynamic time warping') and then the frequency ones ('the dynamic frequency warping'). Researching curves decreasing differences in the frequency domain can provide us with information about possibilities of frequency domain normalization. It deserves particular emphasis because that method can be applied not only for vowel or consonants but also for any arbitrary speech sounds or even utterancies investigations as well. As a quantitative criterion, the so called cumulative distance can be applied here.

Table.
Mean Mahalanobis distances between vowels in the shortest dendrite in normalized and in unnormalized formant frequencies space

Method	data base A.P.	P.&B.	R.G.L.	degr.of freedom
NT	2.94	3.83	5.15	0
LOG	3.37	7.14	7.52	0
STAND	2.29	3.53	6.91	2
AMV	3.40	6.07	6.75	1
GMV	3.74	8.57	8.87	1
BARK	3.14	5.26	5.35	1
BARKO	3.39	6.17	6.41	0
critic. dist. at α=0.01%	0.31	3.34	3.04	-

Notes. The Mahalanobis distances were calculated for 4-dimensional space in cases of A.P. and R.G.L. data and in 3 dimensional space for the case of P.&B. data. In all the cases the first 3 formant frequencies were averaged.

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SOME PROBLEMS OF COARTICULATION IN CV STOP SYLLABLES IN SPANISH AND CATALAN SPONTANEOUS SPEECH

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Introduction

According to Lindblom & Lindgren (1985) a major problem for theories of speech perception as well as for recognition algorithms is the variability of the acoustic correlates of phonetic categories. Quantitative acoustic measurements are different depending on the speech style particularly comparing "lab speech" and "spontaneous speech". An acoustic analysis of different speech styles will provide a very important information about the variability of acoustic correlates in different speaking situations. As G. Fant (1983) said: "The bottleneck for the development of speech-based information systems is neither technological nor economic but is created mainly by the fact that our fundamental theoretical understanding of human speech processes is still limited". The goal of this paper is to compare the amount of coarticulation in spontaneous speech and in isolated words, specially on the basis of the second formant trajectories in CV syllables in Spanish and Catalan. A similar investigation has been done in Swedish by Krull (1987). A comparison with her paper will describe how coarticulation is manifested in spontaneous speech in different languages.

Our hypothesis is that when there is a small difference between the F2 frequence at the CV boundary and the F2 frequence in the middle of the vowel, the degree of coarticulation is high, and when this difference increases, the degree of coarticulation decreases. As Krull (1987) did, we measured F2 at two points on a Voiceprint spectrograms as shown in fig. 1: (L) at the CV boundary --we called this point "locus"--; (T) in the middle of the vowel --we called this point "target"--.

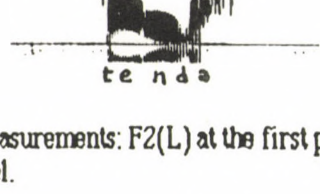

Fig. 1: Example of measurements: F2(L) at the first pulse of the vowel and F2(T) in the middle of the vowel.

We have expressed the relation between the two points by the "locus equation" (Krull, 1987): F2L = C + F2T * K where F2L is the initial locus, F2T the vowel target and K and C are constants. The value of K determines the slope of the regression line for the locus frequencies. The slope shows the amount of coarticulation. When K = 1 locus is completely dependent of the vowel target and there is maximal coarticulation.

Methods

We selected our continuous speech material from the recordings of one male Spanish speaker and one male Catalan speaker in spontaneous conversation. The speakers were asked about their studies and their job. The recordings were made in a quiet room at the Phonetics Laboratory of the Universitat Autònoma de Barcelona.

We analysed word initial CV stressed combinations. These combinations consist in voiceless stop consonants followed by a vowel: C = [p t k] in both languages; V = [i e a o u] in Spanish and V = [i e ɛ a o ɔ u] in Catalan.

We also analysed isolated words. We prepared two lists, one for each speaker, containing the words which had been measured in their spontaneous speech sample. The words were in random order without context. The speakers were asked to read their list with a short pause between items. We called the words of these lists "reference words".

Both in reference words and in spontaneous speech the measurements of locus and target were obtained as shown in Fig. 1.

Results

The resulting locus-target plots can be seen in Figs. 2, 3, 4, 5. Figs 2 and 3 prove that there is more coarticulation in spontaneous speech than in reference words in Spanish, both in labial and dental context (labial context: k = 0.9115 in reference words and k= 0.997 in spontaneous speech; dental context: k = 0.823 in reference words and k = 0.986 in spontaneous speech). Figs. 5 and 6 prove the same effect in Catalan in identic context (labial context: k = 0.93 in reference words and k = 0.972 in spontaneous speech; dental context k = 0.907 in reference words and k = 0.958 in spontaneous speech). However, in velar contexts the results are different: in Spanish k = 0.955 in reference words and k = 1.05 in spontaneous speech; in Catalan k = 1.03 in reference words and k = 1.07 in spontaneous speech. Fig. 6.a) shows the catalan word "canvi" ['kambi] read in isolation and 6.b) shows the same word in spontaneous speech. The excursion of F2 is similar in both styles and it suggests that velar context could have a different behavior.

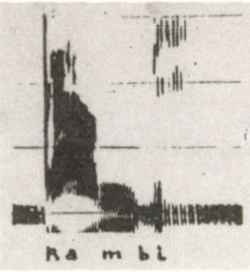

Fig. 6.a)

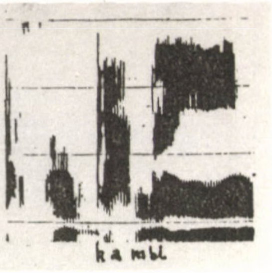

Fig. 6.b)

Discussion

Consequently, our results reveal more coarticulation in spontaneous speech than in isolated words both in labial and dental context in Spanish and Catalan. Krull (1987) found the same results for labial and dental voiced stops in Swedish: labial context: k = 0.81 (speaker 1) and k = 0.61 (speaker 2) in reference words, and k = 0.96 (speaker 1) and k = 0.75 (speaker 2) in spontaneous speech; dental context: k = 0.25 (speaker 1) and k = 0.43 (speaker 2) in reference words, k = 0.45 (speaker 1) and k = 0.47 (speaker 2) in spontaneous speech.

Krull (1987) does not present results about velar context because /g/ before front vowels is, with few exceptions, pronounced as [j], and the velar samples before back vowels showed too little variation in F2 for meaningful locus equations to be set up. It could suggest that the behavior of velar context is also in Swedish different from the behavior of labial and dental ones.

Conclusion

Our study is a preliminary investigation, but these results indicate that the degree of coarticulation is higher in spontaneous speech than in isolated words, in different languages, in labial and dental contexts. More data about velar context are required but it seems that the incidence of coarticulation is different in this case.

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Fig. 2

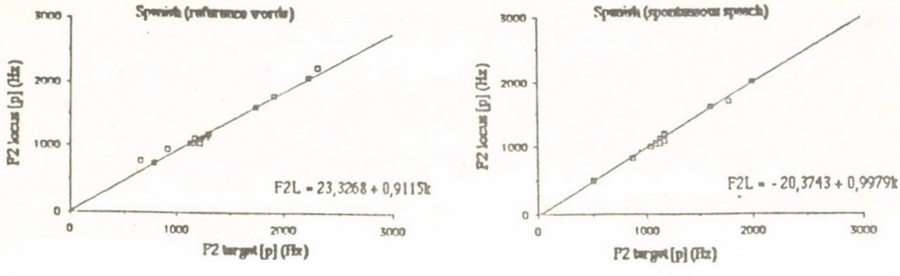

Spanish (reference words)
F2 locus [p] (Hz)
F2 target [p] (Hz)
F2L = 23,3268 + 0,9115k
Spanish (spontaneous speech)
F2 locus [p] (Hz)
F2 target [p] (Hz)
F2L = - 20,3743 + 0,9979k

Fig. 3

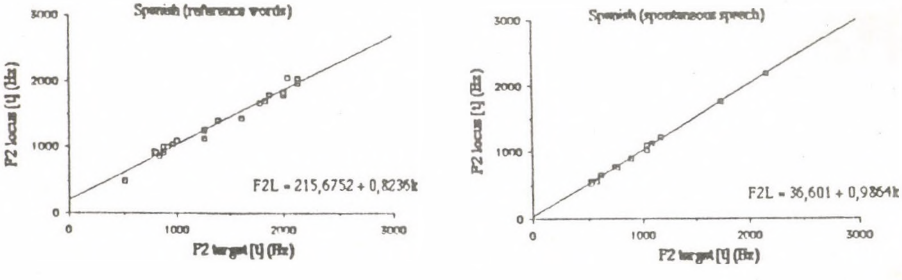

Spanish (reference words)
F2L = 215,6752 + 0,8235k
Spanish (spontaneous speech)
F2L = 36,601 + 0,9864k

Fig. 4

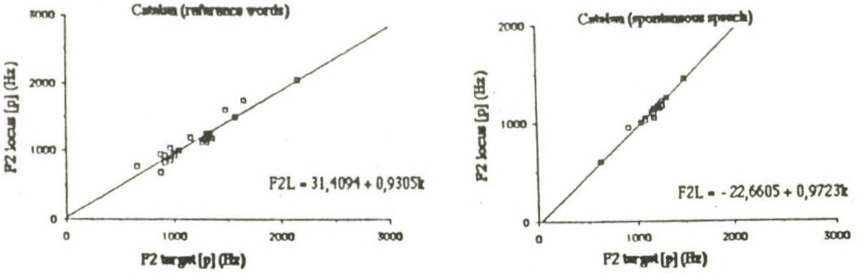
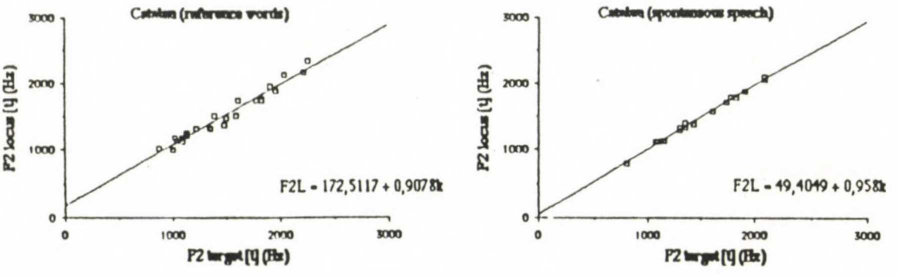

Catalan (reference words)
F2L = 31,4094 + 0,9305x
Catalan (spontaneous speech)
F2L = - 22,6605 + 0,9723x

Fig. 5


Catalan (reference words)
F2L = 172,5117 + 0,9078x
Catalan (spontaneous speech)
F2L = 49,4049 + 0,958x

INTER- AND INTRASUBJECT VARIABILITY IN THE PRODUCTION OF PHONEMIC CATEGORIES

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Introduction

It is one of the main goals of scientific research to gain information about regularities in human behavior. But the dilemma in phonetic research, articulatory as well as acoustic, physiological or perceptual research, is that one has to deal with single subjects, individual speakers or hearers. Thus, all phonetic investigations start with and many of them end up with the analysis of only one subject. It is therefore typical for phonetic results that they contain atleast three different factors: (i) subject-specific, (ii) language- or dialect-specific, and (iii) 'universal' factors. The speaker-specific factor can be controlled for by analyzing the behavior of more than one speaker, whereas the language-specific factor can be examined by comparison with other languages. As these procedures are time intensive, they are often left undone.

In order to separate the factors mentioned from each other one should have in mind that they are different in origin, namely those factors which can be intentionally controlled by the subject and those which cannot. Under this aspect we have to distinguish between (i) anatomical factors, which are exclusively subject-specific, (ii) phonetic factors, which are intentionally controllable and can serve as subject-specific as well as language-specific factors, and (iii) those universal factors, which are neither controllable nor subject-specific.

Having thus outlined the importance of individual or idiolectal influences on phonetic results, which will be called the <u>inter-subject</u> variability, we will now turn to the individual subject itself or the <u>intra-subject</u> variability. It is a well-established practice in phonetic research to make use of average means, medians etc derived from several repetitions of the same utterance in order to avoid being subject to the caprice of fortune. On the other hand, one should bear in mind that this method does not allow the elimination of all potential errors as the raw data are subjected to some statistical procedures in order to compute the significance of the differences between e. g. stop classes. Therefore, the statement about the significance of differences is directly connected with the variability within the data or the <u>intra-subject</u> variability.

In this paper I will, due to the limitation in space and time, focus on the inter-subject variability in the production of the phonemic category of breathy voiced stops in Hindi. Hindi, like other Indo-Aryan languages, too, distinguishes between four stop classes: voiced, voiceless unaspirated, voiceless aspirated, and breathy voiced or so-called 'voiced-aspirated' stops. Whereas the first three classes form parts of the VOT-continuum the fourth category, breathy voiced, does not. It involves a well balanced opening gesture of the glottis, to allow vibrations of the vocal folds as well as a turbulent airflow through the glottis after the stop's release. In Hindi this stop category typically consists of prevoicing during the closure, the release of the closure or the burst, sometimes followed by a voiceless aspiration, and a breathy voiced vowel (cf. for detail [5, 6]). The inter-subject variability in the production of this category is examined by computing the influence of supra-laryngeal factors like the stop's place of articulation and the tongue height and tongue position of the vowel on the duration of the single acoustic portions.

Material, informants and procedure

The material consisted of 150 different Hindi words containing the breathy voiced stops /bh dh ḍh gh/ in word-initial position followed by the vowels /a o u i/. Each stop-vowel combination occured 10 times in the material. Four native speaker of Hindi served as informants: (i) SHA (F, 35 years) born in Simla (Himachal Pradesh) raised in Simla and New Delhi, (ii) MAN (F, 23 years) born in Piprai (Uttar Pradesh), (iii) RPJ (M, 40 years) born in New Delhi, and (iv) PUN (M, 22 years) born in Mirzapur (Uttar Pradesh).

SWA was taped in the sound proofed room of our institute on a Telefunken M15 tape recorder using a Neumann U 87 microphone, whereas the recordings of MAN, RPJ and PUN were made in the language lab of the Centre of German Studies, School of Languages of the Jawaharlal Nehru University in New Delhi using a Uher Report 4002 and a Senheisser MD421N microphone. The material was digitized on a PDP 11/50 (sample rate 20 kHz, cut-off frequency 8 kHz) and segmented with the help of a segmentation routine into four portions: (i) voicing lead (henceforth VLD), (ii) burst and voiceless aspiration, (iii) breathy voiced portion of the vowel, and (iv) the steady vowel portion of the first syllable (cf. for details [5, 6]). The derived duration values were subjected to separate analysis of variance with the factors PLACE of articulation, VOWEL, and SUBJECT. We will here consider the SUBJECT factor only.

Results

(i) Differences between subjects with regard to the duration of the single acoustic portions. The VLD is shortest in PUN (77.29 ms), longer in SWA (85.23 ms) and RPJ (85.37 ms), longest in MAN (101.4 ms). The difference between subjects is significant ($p < .001$). The duration of burst/aspiration is shortest in MAN (19.69 ms), longer in PUN (23.83 ms) and SWA (25.99 ms), and longest in RPJ (38.8 ms; $p < .001$). The breathy vowel is shortest in MAN (52.1 ms) and RPJ (52.73 ms), longer in PUN (65.81 ms) and longest in SWA (76.02 ms; $p < .001$). The duration of all portions together, VLD, Burst/aspiration and breathy vowel, abbreviated here as VBB, is shortest in PUN (166.2 ms), longer in MAN (173.2 ms) and RPJ (177.2 ms), longest in SWA (189.4 ms; $p < .05$). It is worth mentioning that the difference between the extreme productions of PUN and SWA is small, namely 23.2 ms.

(ii) Differences between subjects with regard to the stop's place of articulation (Fig. 1). MAN, RPJ, and PUN agree with respect to the influence of the velar stop on the VLD as it is shortest in this place of articulation. Additionally, MAN and PUN have shorter VLD values in the labial compared with the dental und retroflex stops. SWA differs from all other subjects as she has shorter VLD values in [+ant] stops. Concerning the stop's influence on burst/aspiration all subjects display the same pattern: the burst is longest in the velar, shortest in the retroflex place of articulation. With respect to the duration of the breathy vowel the subjects form two subsets. SWA and MAN have a shorter breathy portion in [-apic] stops, whereas MAN and PUN have shorter values in [+ant] stops. All subjects are comparable with respect to the stop's influence on the duration of all portions, VBB, as they have longest durations in velar and shortest durations in labial stops.

(iii) Differences between subjects with regard to the vowel (Fig. 2). Concerning the influence of the vowel on the VLD there is no clear tendency for all subjects. In SWA and RPJ the longest values are connected with the vowel /i/ and the shortest values with /a/. MAN and PUN have longer VLDs before /i/ and /o/, but the differences are small. There is a clear influence of high vowels on burst/aspiration, as the burst is in all subjects longest before high vowels, except MAN, where only /i/ leads to longer values compared with the other vowels. There is, too, a systematic influence of the vowel on the duration of the breathy vowel portion. It is longest in the vowel /a/, shortest with the high vowels /i/ (PUN), /u/ (RPJ) or both (SWA MAN). Concerning the overall duration of all portions, VBB, SWA and RPJ display similiar results, as VBB is longer when connected with /i/ and /a/, shorter with /o/ and /u/. In MAN's and PUN's productions on the other hand the high vowels lead to shorter VBB.

In order to have a measure for the influence of the stop and the vowel on the acoustic portions I have calculated the difference between the maximal and minimal durations in ms and in percent (cf. tables 1, 2). The difference between the stops is most pronounced in SWA, who has the greatest differences in all acoustic portions (VBB: 24.40%, burst: 80.50%). On the other hand, the influence of the stop is smallest in PUN's productions (VLD: 8.50%, burst: 40.00%). A somewhat different pattern can be found for the vowels. Here the difference is greatest in MAN (VBB: 8.10%, burst: 37.20%).

Some interesting results concerning the duration of VBB and the contribution of the single acoustic portions to VBB were obtained. (i) There is a tendency in all subjects for a constant duration of VBB. The maximal difference between subjects is 23.2 ms. (ii) The maximal difference between the stops is 50.4 ms or 24.4% in SWA, between the vowels it is 26.0 ms or 13.8% in RPJ. (iii) From

(i) and (ii) can be concluded that subjects tend to keep VBB the same or nearly the same in all environments. The exception from this rule is SWA. (iv) From (iii) follows that, as there are remarkable influences of the stop and vowel on the isolated acoustic portions, subjects use some strategies to compensate for these influences. (v) Some of these strategies are: (a) shortening the VLD if the burst/aspiration is long: MAN (/gh/), RPJ (/gh/), PUN (/gh/). (b) shortening the breathy portion if the VLD is long: MAN (/i/), RPJ (/bh ḍh/), RPJ (/a/). (c) shortening the VLD if the breathy portion is long: SWA (/a/), RPJ (/a/). (d) shortening the breathy portion if the burst/aspiration is long: SWA (/i u/), SWA (/gh/), RPJ (/gh/), PUN (/dh gh/). (e) prolonging the VLD if the burst/aspiration is short: SWA (/ḍh/), RPJ (/ḍh/).

Discussion

On the one hand the results from the acoustic analysis point to remarkable differences between subjects, such as a greater amount of VLD in MAN, a greater influence of the stop and vowel in SWA, longer average burst/aspiration values in RPJ. On the other hand all subjects coincide with respect to some other factors. The first class of factors will be called subject-specific, the second class 'universal' factors.

Subject-specific factors are: (i) the overall influence of stop and vowel on the duration of the acoustic portions: large in SWA, small in PUN; (ii) the duration of the VLD: long in MAN, short in PUN; (iii) the overall duration of the burst/aspiration: long in RPJ; (iv) the influence of the stop on the breathy vowel portion: short in [-apic] stops in SWA and RPJ, short in [+ant] stops in MAN and PUN.

'Universal' factors are: (i) the burst/aspiration is long in velar stops, short in retroflex stops; (ii) the VLD is longer before high vowels; (iii) the breathy portion is long in /a/, short in high vowels; (iv) the VLD is shortest in the velar stop (except in SWA).

Some of these results are known from other studies, too. All investigations on VOT confirm a longer burst in velar stops (cf. [2]). This fact is usually explained by the greater amount of tongue mass involved in the closure of velar stops. A longer burst before high vowels was found by Klatt [1] and was confirmed in part by Weismer [7]. Klatt argues that this longer burst/aspiration is caused by the higher tension of the laryngeal muscles involved in the production of high vowels, which prevent the initiation of voicing after the stop's release. The explanation of differences in the duration of the VLD in voiced (and breathy voiced) stops is more complicated. It is well known that the vibrations of the vocal folds would cease after about 4-20 ms after the complete closure of the stop is achieved [4]. In order to prevent the cessation of vibrations some mechanisms for the expansion of the supra-glottal cavity have to be employed. Some of these mechanisms are passive in nature, like the enlarging of the cavity by advancing the place of articulation of the stop and the slackening of the cheeks. This will especially allow a longer VLD in labial stops and the vowel /a/. Active mechanisms are involved when the larynx is lowered or the pharynx widened [3]. These mechanisms can in principle be utilized in the production of all categories of stops and vowels. In three of our subjects the VLD is shortest in velar stops. This seems to connect the duration of the VLD directly with the supra-laryngeal cavity size, giving smaller values if the cavity size is small. But as can be seen from the results, this assumption holds only for /gh/, but not for the other stops as well. SWA on the other hand has the shortest VLD in labial stops, and similiar durations in the other stops. It can be concluded from the results that SWA utilizes active mechanisms in the production of the non-labial stops, whereas only passive mechanisms are involved in the production of labial stops. The prolonged breathy portion in low vowels and shorter duration in high vowels has not yet been explained. But this phenomenon may be caused by the same physiological factor as the prolonged burst before high vowels, namely a higher tension of the vocal cords in high vowels connected with a somewhat higher larynx position, which both prevent breathy phonation and result in a voiceless instead of breathy vowel portion.

In order to summarize the main results of our study special attention has to be called to two aspects. The first concerns the tendency of the subjects to keep the overall duration of all portions, VBB, the same in all stop and vowel conditions as well as the strategies employed for the compensation of differences in the duration of the individual acoustic portions. Irrespective of the fact that the comparable duration of VBB might be in part caused by the material (breathy voiced stops in initial word-position) and the recording procedure (citation forms), it is most important to note that subjects indeed use some strategies for compensation and that these strategies differ according to the subject and/or the stop and vowel condition. The second aspect is the comparability of our so called 'universal' results with those from other studies. With respect to these results it should be noted that we have confirmed results from voiced stops with those gained from breathy voiced stops, a phonemic stop category which has only infrequently attracted the attention of phoneticians.

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Table 1: max. difference between stops in ms and percent

		VLD	BURST	BRE	VBB
SWA	ms	36.40	52.76	41.60	50.40
	%	21.45	80.50	32.70	24.40
MAN	ms	17.12	17.03	2.95	10.40
	%	15.60	53.50	5.50	5.80
RPJ	ms	12.80	34.66	17.00	12.60
	%	14.30	57.01	28.15	6.97
PUN	ms	6.81	23.40	9.32	20.90
	%	8.50	40.00	13.50	11.60

Table 2: max. difference between vowels in ms and percent

		VLD	BURST	BRE	VBB
SWA	ms	20.56	12.80	31.70	14.10
	%	21.45	33.20	32.70	7.10
MAN	ms	13.88	37.20	21.80	15.00
	%	12.90	37.20	35.60	8.10
RPJ	ms	13.20	12.00	33.00	16.00
	%	14.50	25.90	43.60	13.80
PUN	ms	7.90	8.10	20.70	12.00
	%	9.75	29.60	26.70	6.90

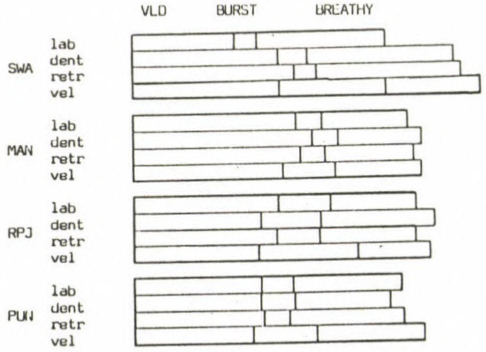

Fig. 1: Duration of VLD, burst/aspiration and breathy vowel portion; stop effect

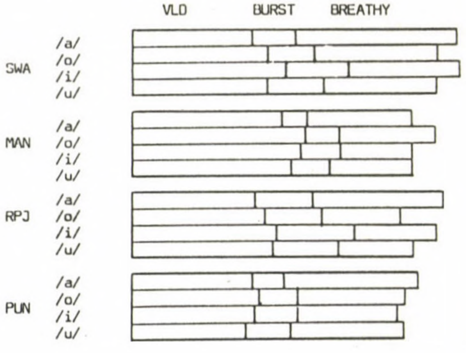

Fig. 2: Duration of VLD, burst/aspiration and breathy vowel portion; vowel effect

PARTICLE PHONOLOGY AND THE GREAT VOWEL SHIFT

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The history of generative phonology up to the present moment can be divided into two phases. In the first phase, phonologists were primarily concerned with the rule system that related underlying phonological representations to their surface (phonetic) manifestations. Following van der Hulst and Smith (1982), we can call this the derivational aspect of the theory. The central topics in this phase included rule formulation, rule application, rule ordering, and the degree of abstractness of underlying representations. In the second phase attention has shifted to the structure of the phonological representations themselves (i.e. the representational aspect).

This shift of focus has resulted in a number of theories of what has become known as 'non-linear phonology' (autosegmental, cf. Goldsmith 1976, Halle & Vergnaud 1982, Clements 1985; metrical, cf. Liberman & Prince 1977, Hayes 1982, Giegerich 1985, Hogg & McCully 1987; CV phonology, cf. Clements & Keyser 1983; charm and government, cf. Kaye, Lowenstamm & Vergnaud 1985; dependency, cf. Anderson & Ewen 1980, Durand 1986). One thing all these different theories have in common is that they envisage richer phonological structure than the simple-minded segments-and-boundary-symbols view of standard generative phonolgy. Another (minor) development along the same lines is Sanford A. Schane's Particle Phonology (Schane 1984a,b). The purpose of the present paper is to introduce and exemplify this "radically different way of describing vowels and diphthongs -- their internal structures, their relationships, and their evolution and change" (1984a: 130). Although Schane's proposals have a lot in common with certain varieties of autosegmental phonology (cf. Goldsmith 1985) and dependency phonology (cf. Anderson, Ewen & Staun 1985), they also differ from them in that his representations lack any kind of hierarchical or geometrical organization and are thus conceptually simpler.

1. The primitive phonological elements of particle phonology are the elementary particles a (aperture), i (palatality), and u (labiality), as well as three punctuators: + (syllable boundary between [particle sets representing] adjacent vowels), space (length) and ‿ (nonsyllabicity). Short vowels are then represented along the following lines:

Table 1.

[i]	i	[u]	u	[y]	iu	[ɨ]	-
[e]	ai	[o]	au	[ø]	aiu	[ʌ]	a
[ɛ]	aai	[ɔ]	aau	[œ]	aaiu	[a]	aa

In representations of long vowels, e.g. ai i for [e:] or aiu iu for [ø:], the space marks length, whereas the repeated tonality particles indicate tenseness (in vowel systems where this is relevant). Lax vowels, on the other hand, are represented by an additional aperture particle, thus ai for [I], aau for [O], etc. Although this makes eg. ai ambiguous between short nonlax mid [e] and lax high [I], Schane claims that such contrasts are not attested in vowel systems and consequently this flexibility of the notational framework is a virtue, rather than a shortcoming. Sample analyses of historical processes in various languages offer an excellent demonstration of this point (1984a:143ff).

In monophthongs, particles constitute an unordered set (written in alphabetical order for convenience). In the particle representation of diphthongs, however, partial ordering obtains (with the 'half-moon' punctuator identifying the non-syllabic portion). Furthermore, diphthongs counting as more than one mora contain 'space' as part of their representations. Thus: 'overshort' diphthongs (one mora): e.g. [e͡i̯] = aii̯; normal diphthongs (two morae): [ei̯] = ai i̯; 'overlong' diphthongs (three morae): [e:i̯] = ai i i̯.

For a fully worked-out concrete example, consider now the vowel system of British English RP; the particle analysis as it appears below is mine (Schane's papers include non-language-specific displays of sample vowel types; a mixed system with tense/lax cutting across monophthongs and diphthongs might be more revealing at this point than a simple reproduction of Schane's tables [see 1984a:131-133; 1984b:39]).

Table 2.

		LAX VOWELS			
pit [ɪ]		put [ʊ]	ai		au
pet [ɛ]	putt [ʌ]		aai	aa	
pat [æ]		pot [ɒ]	aaai		aaau
		TENSE VOWELS AND DIPHTHONGS			
beat [i:]		boot [u:]	i i		u u
bait [eɪ]		boat [əʊ]	ai i̯		au u̯
bite [aɪ]	boy [ɔɪ]	bout [aʊ]	aa i̯	aau i̯	aa u̯
		BROKEN AND BROAD VOWELS			
peer [ɪə]		poor [ʊə]	ai a̯		au a̯
pear [ɛə]	purr [ɜ:]	pour [ɔ:]	aai a̯	a a	aau u
		part [ɑ:]			aa a

Particle analysis of the vowel system of British English RP

Before turning to the operations of particle phonology, let us compare the properties of distinctive features and those of elementary particles. As Schane points out (1984a:150), the former are atomistic, inclusive, unitary, and autonomous, whereas the latter are compositional, additive, multiple, and dependent. In other words, in a DF framework "segments are composed of features; segments are specified for all relevant features; each feature occurs exactly once; and the phonological interpretation of features is (by and large) language-independent". By contrast, in particle phonology "complex vowels are composed of simpler ones; vowels are specified only for those components present; particles may occur multiply; and because of their different functions, the interpretation of particles is language-dependent" (ibid.). Because of their small number, particles have to be rather versatile: in isolation, they correspond to the basic vowels [i], [u], and [a]; in combination they represent phonological traits or properties. Tonality particles, in addition to frontness (_i_) and roundness (_u_), represent tenseness and/or length, as well as upglide, whereas the aperture particle _a_ represents openness, laxness, length in open vowels, and downglide. They are somewhat like basic colours: red, blue and yellow can occur in 'isolation', but they also make up all other, 'complex' colours if combined in various ways.

2. Particle phonology recognizes seven basic operations: _fusion_ (monophthongization), _fission_ (diphthongization), _mutation_ (tonal dissimilation), _cloning_ and _droning_ (assimilation by adding/dropping some particle, respectively), _accretion_ and _decay_ (spontaneous, i.e. nonassimilatory, addition/loss of a particle).

Fusion and fission both affect the sequencing of particles. In _fusion_, the separately occurring particles of a diphthong fuse or combine into a single complex configuration for the monophthong. "One of the prime virtues of particle notation [Schane claims] is the ease with which it relates particular diphthong/monophthong pairs" (1984a:133). Examples:

(1)	[ai̯] > [e]	ai̯ > ai	Gothic, Romance, Sanskrit
	[au̯] > [o]	au̯ > au	Gothic, Romance, Sanskrit
	[oi̯] > [ø]	aui̯ > aiu	Greek

Fission is the opposite of fusion: the complex particle configuration of a monophthong is split up to become a sequence of particles for the diphthong. Examples:

(2)	[y] > [i̯u]	iu > i̯u	Middle English
	[e:] > [ei̯]	ai i > âi i̯	Old French
	[o:] > [ou̯]	au u > au û̯	Old French

Mutation interchanges the two tonality particles: _i_ is replaced by _u_, and _u_ is replaced by _i_. This is the particle analogue of tonal dissimilation. As a consequence of mutation, there is greater tonal separation between the syllabic and nonsyllabic halves of a diphthong. Examples:

(3)	[ei̯] > [oi̯]	ai i̯ > au i̯	Old French
	[ou̯] > [eu̯]	au û̯ > ai û̯	Old French

Cloning and droning affect the number of particles in a configuration; both are the particle analogues of assimilation. In one common type of _cloning_, a particle from one syllable is copied into the vowel of another syllable.

Germanic umlaut is an obvious example: [u] and [o] when followed in the next syllable by [i] were fronted to [y] and [ø], respectively. The particle i from the umlauting environment was copied into the preceding vowel. Similarly, labial umlaut involves copying the particle u. Cloning of the aperture particle, as in early Germanic, results in lowering [i] and [u] to [e] and [o]; another type of aperture cloning can be observed in Rumanian breaking. Finally, cloning can also take place between the two parts of a diphthong, as in Old High German [ai̯] > [ei̯], [au̯] > [ou̯], where the tonality particle of the glide was cloned into the nucleus of the diphthong. Summarizing the examples:

(4)	[u] > [y] /__ [i]	u > iu /__i	Germanic
	[i] > [e] /__ [a]	i > ai /__a	Early Germanic
	[e] > [e̯a]/__ [a]	ai > a̯ia/__a	Rumanian
	[ai̯] > [ei̯]	a i̯ > ai i̯	Old High German

In Old English umlaut, the changes [u] > [y], [o] > [ø], [a] > [æ] involve the cloning of i. The change [æ] > [e], however, is an example of <u>droning</u>: the only way [æ] can become more like the following i is through a loss of aperture (or increase in height). For the umlaut process, then, vowels that lack the palatal particle will acquire one (cloning), whereas those already possessing it will lose an opposing particle (droning). Further examples of droning can be found as part of the Great Vowel Shift:

(5)	[ɛ] > [e] /__ [i]	aai > ai /__i	Old English
	[e:] > [i:]	ai i > i i	Early Modern English (GVS)
	[ɛ:] > [e:]	aai i > ai i	Early Modern English (GVS)

Accretion and decay involve changes in the number of particles in non-assimilatory environments. <u>Accretion</u> is the spontaneous addition of a particle. Examples:

(6)	[a] > [ɔ]	aa > aau	Old Hungarian
	[u] > [y]	u > iu	Old French
	[i] > [I]	i > ai	Vulgar Latin
	[ii̯] > [ei̯]	i i̯ > ai i̯	Early Modern English (GVS)

/The above examples -- in fact, most of the foregoing examples given under (1)-(5) as well -- are not isolated changes but representative samples of more comprehensive processes. To see one such process in its entirety, consider the following set of changes taken from the history of Hungarian. In the Old Hungarian period, all short vowels except low [ɛ] and [a] underwent a downward shift so that the high vowels [i], [y], and [u] became mid, and the mid vowels [e] and [o] became low. This change -- call it Reverse Vowel Shift (RVS) to suggest that it is the opposite, in many ways, of the Early Modern English Great Vowel Shift to be discussed below -- introduced two new vowel qualities (front mid round [ø] and low back round [ɔ]) and also involved a merger between [e] and [ɛ]. (A simultaneously occurring rounding shift -- [i] > [y] and [a] > [ɔ] -- resulted in another instance of merger, this time between the two sources of [ɔ], viz. [o] and [a]; and reintroduced [y] into the system.) In particle-phonology terms, RVS can be seen as an instance of <u>accretion</u>, along the following lines:

(7)	[i] > [e]	i > ai	[y] > [ø]	iu > aiu	[e] > [ɛ]	ai > aai
	[u] > [o]	u > au			[o] > [ɔ]	au > aau

That is, an aperture particle <u>a</u> was -- apparently spontaneously -- added to all five vowels involved. For further details and for an interpretation of the process in acoustic terms, cf. Vértes (1974)./

Finally, <u>decay</u> is the simplification of a complex particle configuration through spontaneous loss of one or more particle(s). Most neutralizations provide examples of decay:

(8)	[y] > [i]	iu > i	Greek
	[e] > [a]	ai > a	Sanskrit

Both examples involve merger: unrounding in Greek merged [y] with [i]; and in Sanskrit [e] and [o] lowered to merge with [a]. Russian exemplifies a mixed system where, in unstressed positions, [e] has merged with [i], a loss of aperture, but [o] has merged with [a], a loss of tonality:

(9)	[e] > [i]	ai > i	Russian
	[o] > [a]	au > a	Russian

As a final, and more complex, example, consider the following 'chain reaction' taking Vulgar Latin [o:], [e:] to Modern French [ø], [u̯a] as in Lat. <u>flōr-</u>, <u>mē</u>; French <u>fleur</u>, <u>moi</u>:

(10)	[o:] > [ou͓] > [eu͓] > [ø]		au u > au u͓ > ai u̯ > aiu	
	[e:] > [ei̯] > [oi̯] >	[u̯e] > [u̯a]	ai i > ai i̯ > au i̯ >	u̯ai > u̯a
			Fiss M̂ut F̂us/Fisŝ	Dec̑ay

<u>3.</u> An important set of changes affected stressed, long, tonality vowels in Early Modern English. By the beginning of the sixteenth century, high vowels had diphthongized, become lax, and shifted downwards one step, whereas mid and low vowels remained monophthongs but had been raised one degree in height:

(11)
```
          i:    u:
        ↙ ↑     ↑ ↘
     ei̯   e:    o:   ou̯
          ↑     ↑
          ɛ:    ɔ:
```

This set of changes represented the first phase of what is generally known as the Great Vowel Shift (henceforth GVS), the particle-phonology analysis of which is the main concern of the rest of this paper. For a traditional account of GVS in general, cf. Jespersen (1909:231ff); see also Wolfe (1972) for a thorough investigation of the manuscript evidence for the various phases of GVS. The classical generative analysis of GVS is due to Chomsky and Halle (1968:259-266); see further Anderson and Jones (1977:69ff) for an account in terms of dependency phonology.

Before turning to Schane's analysis, we have to briefly consider a rather important problem concerning the sequence of events leading to the general pattern of shift as depicted above. The traditional interpretation, going back to Jespersen (and also espoused by Chomsky and Halle) is what is called a 'drag chain' whereby the high vowels diphthongize, leaving 'empty slots', and the mid vowels 'move up' into the vacated positions, leaving slots behind them which the low vowels then move up to fill. Alternatively, the movement could have begun from below, each vowel 'pushing' the next one up out of place. The high vowels, having no higher slot to raise to, diphthongize. This scenario is called a 'push chain'. Still a third possibility is that there was a mixture: say a push chain beginning with [e:] and [o:], and then a drag chain involving [ɛ:] and [ɔ:]. Although historical evidence itself does not tell us what the sequence actually was, there are good reasons to believe that the correct version is in fact the third one. As was first pointed out by Richard Carter (1975) and later convincingly argued in detail by Roger Lass (1976:65ff), modern Northern British dialects in which the reflex of Middle English [u:] is [u:] rather than [au̯] <u>and</u> the reflex of Middle English [o:] is [i:] demonstrate that GVS must have begun with the raising of the mid vowels. In these dialects, prior to GVS, the following sound changes occurred:

(12)
```
        i:     y:     u:
               ↑
        e:     ø:  ←  o:

        ɛ:            ɔ:
```

The resulting pattern then underwent GVS as follows:

(13)
```
           i:     y:     u:
         ↙ ↑
    ei̯     e:            o:
           ↑             ↑
           ɛ:            ɔ:
```

Subsequently, [y:] was unrounded to [i:]. The developments in these dialects, then, suggest that the order in which GVS proceeded (in general) must have been as indicated in the third version above: that it was the raising of mid vowels that caused the high vowels to diphthongize, and enabled the lower ones to move up one step and occupy the slots vacated by the mid vowels. But what made the mid vowels start shifting in the first place?

<u>4.</u> Schane's answer to that question crucially involves the notion of <u>height assimilation</u>. An assimilatory change like [e]>[i] can be triggered by an <u>i</u> in the following mora, irrespective of whether that <u>i</u> appears in the following syllable as in early Germanic [e]>[i]/___C_0i, or is the nonsyllabic portion of a diphthong as in Middle English [ei̯]>[i:], or indeed, as in the present case, simply (a component of) the second mora of a long monophthong. Recall that in particle notation the only difference between monophthongal [e:] <u>ai i</u> and diphthongal [ei̯] <u>ai i̯</u> lies in the syllabicity/nonsyllabicity of the second tonality particle. As we saw above in the discussion of <u>droning</u>, this particle may induce loss of an aperture particle (heightening of tonality) in a preceding mora.

This explanation, as far as it goes, accounts for the raising of mid vowels to high, as well as that of low vowels to mid. Curiously, the diphthongization of high vowels (beyond the obvious connection that they had to, as it were, 'get out of the way'), is also based on the same trend toward heightened tonality. Diphthongization (or fission) splits apart the properties of a monophthong and serializes them. The second tonality particle of long [i:] and [u:], unable to cause raising in the preceding mora, is highlighted instead as a separate component of heightened tonality (ie., a glide). But then, how can we explain the lowering that occurred in the first part of the diphthong? The crucial factor here is the interdependence of long/short and tense/lax in English. Diphthongization turns a long vowel into a short vowel and a glide. Because of the association between length and tenseness, and between shortness and laxness, the short vowel of the derived diphthong must be lax. Hence, in such a system, [i:] will diphthongize to [Ii̯] and [u:] to [Uu̯]. In particle analysis, this means that a derived short vowel automatically acquires an aperture particle; that is, i i and u u, upon diphthongizing, must become ai i̯ and au u̯, respectively. Notice that given this interpretation, no separate 'lowering' is involved here: laxness, in a bimoric situation, is simply reinterpreted as lowered height. Thus, particle notation helps resolve two seeming paradoxes: first, although phonetically the syllabic part of these diphthongs is a short lax vowel, the diphthong as a whole continues to function as part of the long (tense) vowel system; and second, within that system, the diphthong now corresponds to a mid vowel.

That completes our account, in particle-phonology terms, of the first part of GVS. The rest of the changes, summarized below, are amenable to similar treatment in this framework:

Table 3.

Stage I	(Middle English)	i:	e:	ɛ:	a:	u:	o:	ɔ:
Stage II	(16th century)	ei̯	i:	e:		ou̯	u:	o:
Stage III	(17th century)	ʌi̯			ɛ:	ʌu̯		
Stage IV	(GVS completed)	ai̯		i:	e:	au̯		
Stage V	(today)				ei̯			ou̯

At Stage III, the diphthongs get centralized (an instance of decay, ai i̯ > a i̯ and au u̯ > a u̯), and [a:] is palatalized to [ɛ:] (by accretion, aa a > aai i). At Stage IV, a second raising of nonhigh front vowels (droning, motivated as above) and further lowering of diphthongs (accretion, for maximal differentiation between halves of diphthongs) can be observed. The particle analysis of all the changes can be summarized as follows:

Table 4.

	[i:]	[e:]	[ɛ:]	[a:]	[u:]	[o:]	[ɔ:]
Stage I	i i	ai i	aai i	aa a	u u	au u	aau u
Stage II	ai i̯	i i	ai i		au u̯	u u	au u
Stage III	a i̯			aai i	a u̯		
Stage IV	aa i̯		i i	ai i	aa u̯		
Stage V				ai i̯			au u̯
	[ai̯]	[i:]	[i:]	[ei̯]	[au̯]	[u:]	[ou̯]
	bite	beet	beat	mate	out	boot	boat

Types of operations involved:

Table 5.

	I > II	II > III	III > IV	IV > V
bite	fission/accretion	decay	accretion	--
beet	droning	--	--	--
beat	droning	--	droning	--
mate	--	accretion	droning	fission
out	fission/accretion	decay	accretion	--
boot	droning	--	--	--
boat	droning	--	--	fission

5. Let us finally quote a poetical passage from Schane (1984b:49). It tells about 'particle exchange' as the key notion underlying the changes involved in GVS; whether the emotional overtones in this passage are directed towards the Great Vowel Shift or towards Particle Phonology remains for the reader to decide:

> "At stage II, the four nonhigh tonality vowels each lose an aperture particle, while the two (diphthongized) high vowels acquire one. At stage III, the diphthongs each lose one tonality particle, and the vowel [a:] acquires particles for tonality (i.e., palatality). Stage IV is a recapitulation of aspects of stage II: both nonhigh front vowels lose an aperture particle, while the diphthongs each acquire one.
> At every stage we find a reciprocal exchange of particles. A segment or group of segments loses a particular kind of particle, while that same type of particle is acquired by some other segment(s). It is as though there is a constant flow of energy moving throughout the vowels. The beauty of the Great Vowel Shift lies in this delicate balance."

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MENTAL HEALTH PROBLEMS OF THE ELDERLY

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Health problems increase in life's later years and as they do, most persons become more conerned with their health than they were when they were young. This preoccupation produces a greater readiness not only to seek health service, but also to learn health maintenance. However, the healthcare professional who works with elderly persons must deal with a number of obstacles that are prevalent in older age groups.

Because today's elderly were raised at a time when expression of emotion was held back, they often describe symptoms of depression to the healthcare provider in such a way that the depression is incorrectly understood as a physical disease. As a result, depression in the elderly often is underdiagnosed and undertreated. In addition, psychical and emotional disorders often occur together in an older person, and it can be difficult to determine accurately whether a particular symptom is related to a mental health disorder, a physical disease, a side effect from drug, or a combination of all of these.

Potential Mental Disorders: It is estimated that so-called senility (the physical and mental infirmity of old age) does not appear often among persons who are between the ages of 60 and 80 years, but it may appear in approximately 20% of persons who are 80 years or older. Only a small percentage of senility in older persons is caused by physical detoriation. However, many may appear to be senile because of their lack of interest, boredom, or isolation much of which is attributable to the sensory deprivation caused by speech and hearing problems.

Depression: A Mental Health Condition: Older persons are sometimes considered senile when they actually are suffering from severe depression. It is unfortunate when this happens, because if the condition were treated as a depressive illness, chances for recovery would be good. Generally, depression is caused by several factors in combination. Each persons reaction depends on how those factors affect him or her. A series of severe personal problems - the death of loved ones, chronic physical illness, unexpected or continuing financial problems, or traumatic divorse or separation - can combine to create suffering and loss of self-esteem, and can result in depression. Clinical depressions are estimated to occur in only 10%.

Depression can also cause physical problems. For example, a depressed older person may gradually lose interest in food and become malnourished, or he may lose interest in communicating with others, and have the appearance of having sigificant hearing loss.

Paraphrenia: Audiologists are the health professionals most likely to have contact with a group of older persons believed to have a condition called paraphrenia. Rothdescribed the term paraphrenia as schizophrenia with onset after age 60 years - a condition in which paranoid delusions and hallutinations are prominent, but in which signs of dementia or sustained confusion are absent. It appears that there may be a relationship between hearing loss and this paranoid psychosis that has been reported frequently in a significant proportion of the older mentally ill population. These older persons were found to have a more severe degree of hearing loss and were more often socially deaf than were other older persons.

Drug-Induced Disorders: Often, older persons who are being treated for age-related illness are given medications that can affect mood. Side effects can occur almost immediately, or they may take up to a year to appear. Often in cases in which several medications are being used at the same time, the combination of drugs can cause mood change. When this occurs, it must be decided whether the benefits of the medication outweigh the risks of depression and other mood changes. - As audiologists and speech-language professionals 'we must incorporate in our treatment strategies methods of alleviating patients' mental health problems.

It is difficult to say whether depression or other related mental health disorders can recur, the chances that they will not reappear are improved if a positiv change can be made in the older persons' life situation and his or her health. For example, if an elderly person's hearing loss is effectively treated with a hearing aid or with surgery, then communication and interaction with his environment and with other persons are restored to him, reducing his social isolation. And if family and social supports are strengthened and new skills for coping with difficult life situations are learned, the older person has a greater chance of recovering from future episides of depression.

When older persons experience mental health disorders, they can benefit from counseling services. It cannot be stressed enough that treatment is available, and that when the proper actions are taken, quality of life for older persons will be enhanced, and they will realize that they both need and deserve recognition and service.

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AZ ÉLETKOR HATÁSA A BESZÉDTEMPÓ ALAKULÁSÁRA

Subosits István
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Az egyén beszédtevékenységének tempóját, amelyet tempóindexszel szokás kifejezni, egyrészt meghatározzák az egyén genotípusának jellemzői. Ezt támasztják alá a hadaró egyének családfájára vonatkozó kutatások adatai. A beszélő "fenotípusa" már tartalmazza azoknak a külső hatásoknak a befolyását is, amelyek a különböző nyelveknek a tempóra vonatkozó normáival függenek össze. A beszédre mint pszichofiziológiai tevékenységre is érvényes az a determináltság, amelyet a pszichikai képződményekre szoktunk alkalmazni, hogy a külső okok a belső feltételeken keresztül alakítják ki a képződményt. Ami a belső feltételeket illeti, az a beszélő egyén idegrendszeri sajátosságaival van összefüggésben. A beszédtempó aktuális alakulását befolyásoló külső "okok" között három tényezőt szokás felsorolni: a szűkebb és tágabb nyelvi környezet, amelyből többek közt a tempónorma "absztrahálódik", a helyzet, amely kiváltja a közlést, és a szöveg szemantikai tartalma, illetve szintaktikai jellemzői.

A beszédtempónak az életkorral való összefüggése abból következik, hogy a beszédtevékenységet a neuroendokrinális rendszer szabályozza, s ez a szabályozás életkoronként változik. Az életkorral együttjáró beszédtempó-változás másik oka, hogy az örökletes és környezeti tényezők viszonya más és más a különböző életkorokban. A fejlődés korai szakaszaiban nagyobb az örökletes tényezők hatása. De összefügghet a tempó változása az életritmus megváltozásával is; a fiatalabb életkorokban nagyobb mértékben dominál a felgyorsult életritmus, s ez kihat a beszédtempóra is.

Eszközfonetikai vizsgálatunk eredményeivel arra próbálunk választ adni, hogyan befolyásolja az életkor a beszédtempót. A vizsgálatban hat 18--22. életév (2 férfi, 4 nő) és négy 50--60. életév (2 férfi, 2 nő) közötti egyén vett részt. Az előbbi vizsgálati csoportot a továbbiakban junior (j. cs.), az utóbbit szenior (s. cs.) nevezzük. Az egyének szövegfelolvasását hangszalagon rögzítettük, majd oszcillográf segítségével hangregisztrátumokat készítettünk. Az oszcillográf rögzítési sebessége 50 mm/s volt; 1 m távolság 20 ms-nak felel meg. A vizsgálatban részt vett személyek a felolvasás előtt megkapták a szöveget, rövid ideig tanulmányozták abból a célból, hogy kifejezően olvashassák fel.

A szöveg, amelyet Asztalos István: A bátor fiú c. elbeszéléséből vettünk, 112 szót tartalmazott. A felolvasott szövegben egyaránt előfordultak rövid és hosszú mondatok, kijelentő, kérdő, felkiáltó és felszólító mondatok. Szerkezet szempontjából 4 egyszerű, 7 összetett mondatot tartalmazott. A szövegrészlet stílusa elbeszélő jellegű, tarkítva dialógusokkal.

A beszédtempóval kapcsolatos időtartam-számítások a következőkre terjedtek ki:

1. Mennyi időt használtak fel a szöveg felolvasására? (T).
2. Ebből mennyi időt fordítottak a szünetekre? Ezt nevezzük a szünetidőtartamnak (SZT).
3. Mennyi a hangképzésre fordított idő (HT)?
4. Hogyan aránylik a két csoport beszédében a szünetek időtartama az összidőhöz?
5. A tempóindexek értékei és átlagaik a két csoport felolvasásában.

1. A j. cs. tagjai a szöveg felolvasására a következő időtartamértékeket fordították: 51,1; 54,9; 45,7; 42,6; 49,1; 45,9 s. Az átlagérték: 48,21 s. - A s. cs. tagjainak értékei: 66,9; 65,1; 56,9; 65,8 s. Az átlagérték: 62,3 s. - Ha összehasonlítjuk a két csoport átlag T értékét, s a j. cs. értékét 1-nek vesszük, az 50--60. életév közöttiek 1,29-szor több időt használtak fel a szöveg felolvasására.

2. Szünetidőtartamra vonatkozó értékek a következők:
J. cs.: 12,58; 14,3; 8,34; 8,1; 12,41; 12,86 s. Az átlagérték: 11,4 s. Az idősebb korosztály beszélőinek a szünettartási időtartama: 14,3; 12,4; 10,6; 18,2 s. Az átlagérték: 14,6 s. - Ha összehasonlítjuk a két csoport szünetidőtartamainak átlagértékét, s a fiatalabb korosztály értékét 1-nek vesszük, az s. csoport tagjai 1,28-szor több időt fordítottak a szünetekre.

3. Kiszámítottuk, hogy a két csoport felolvasásában mekkora a HT, a hangképzésre fordított "tényleges" időtartam. A junior csoport átlagértéke 40,11 s, a srnioré 48,97 s. Az arány közöttük 1:1,22. Az idősebb korosztály tehát majdnem egynegyedével több időt használt fel a hangképzésre, mint a fiatalabb korosztály.

4. Az időtartamértékek alapján választ kaptunk arra is, hogyan viszonylik a két csoport beszédében a szünetek időtartama, illetve a hangképzésre fordított idő az összidőhöz. Az adatok a következő értékeket mutatják:

	szünetek	artikulációs idő	összidő
j. cs.	23,53 %	76,47 %	100 %
s. cs.	22,80 %	77,20 %	100 %

5. Kiszámítottuk 672 szó (a j. cs. által artikulált szómennyiség), illetve 448 szó (a s. cs. által ejtett szómennyiség) artikulációs időtartama alapján a tempóindexeket. A 18--22. életév közöttiek tempóindexe 13,56 volt, az idősebb korosztályé 11,58. Az arányuk, ha a s. cs. tempóindexét 1-nek vesszük, 1:1,7.

Röviden összefoglalva az eredményeket, a viszonylag kevés beszélőre kiterjedő vizsgálat azt mutatja, hogy a szövegfelolvasáskor a fiatalabb korosztály tempóindexe nagyobb, majdnem egyötödével gyorsabb a beszédük, mint az idősebb korosztályúaké. Kevesebb időt használnak fel a szöveg felolvasására, beleértve a szünetek tartását is. A beszédtempó életkorral együttjáró megváltozása elsősorban a neuroendokrinális rendszer megváltozásával függ össze. De nem zárható ki a felgyorsult életritmusnak inkább a fiatalokra "kisugárzó" hatása sem.

HOMMAGE A IVÁN FÓNAGY

In commemoration of his 70th birthday

A general principle of epistemology that underlies Iván Fónagy's oeuvre is--I would claim--the category of 'multidimensionality'. No doubt, both the topics he has chosen for fighting with and the methodological frames of his activity show an abundance of the aspects of possible approximations his research work of more than four decades now ranges over, i.e. linguistics (including phonetics and phonology), the science of literature and, not least, psychology. It is quite a rare thing in 20th-century science that somebody rises to the peaks of international acceptance in more than one branch of research work. Iván Fonagy succeeded in doing so.

He was born on the 8th of April 1920 as the son of an architect in Budapest in a family with a firm and active tradition of European culture. His maturation as a linguist--and as a scientist, in general--took place at the Chair of General Linguistics and Phonetics (Budapest) founded by Gyula Laziczius, the towering exponent of Prague School phonology in Hungary, and was facilitated by a scholarship which allowed him to do research work in the war time in Paris, the city that was to give him shelter a second time some 25 years later.

After being the head of the Department of Phonetics at the Hungarian Academy of Sciences between 1959 and 1967, he was called to occupy the post of an extraordinary professor at Sorbonne Nouvelle and was appointed a principal research fellow of CRNS in Paris. Here he earned 'doctorat d'état' in 1971 and the title of 'directeur de recherche' in 1979, respectively. Professor Fónagy is a member of Société Linguistique de Paris, International Phonetic Association, Societas Linguistica Europae, and the New York Academy of Science. As one of the welcome consequences of the spring of a new democracy in the post-war history of Hungary, he will also be awarded with the title of 'honorary fellow of the Hungarian Academy of Sciences' this year.

Active and effective as he has been in all of his competence areas in the past few decades, his 70th anniversary is but a festive date in his life providing us, however, with the opportunity to present our congratulations. On this occasion let me mention two of his most fruitful and elegant theories that found widespread acceptance in the literature of linguistics and made him a well-known authority on, and an acknowledged expert in, the respective fields. In fact, there is a mutual interrelationship connecting the two theories with each other. The theory of demotivation and remotivation of the linguistic sign establishes and highlights a close theoretical connection between the process of the genesis of human language on the one hand, and the manner of functioning of the individual acts of language use on the other, documenting that connection by a huge collection of data taken from the history of languages and, at the same time, by those taken from (synchronic) speech events. (Per analogiam, this conception is identical in both character and weight to that of Haeckel's Law in biology.) The second is his theory of what is labeled as 'double coding', exposed in several articles and in his 'La vive voix' (Paris 1983). 'Double coding' claims--and also evidences--the inevitable coexistence of an elementary--archaic component and a demotivated--abstract component in speech.

It is certainly an inadmissibly arbitrary way of evaluation to pick out one or another theorem from the richness of an oeuvre like Iván Fónagy's. So, to offer a more comprehensive overview which is meant, at the same time, to be a more authentic one, let me give here a select bibliography of his works.

Tamás Szende

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KÁLMÁN BOLLA: 60

Professor Kálmán Bolla, Head of the Department of Phonetics at the Eötvös Loránd University (Budapest), Doctor of Linguistics, member of numerous Hungarian and international professional societies, is 60 years old. We, his colleagues and pupils, congratulate him on this occasion with respect and love.

Kálmán Bolla's career is characterised by the organic unity of teaching and research. He has been teaching uninterruptedly at the Eötvös Loránd University ever since he finished his studies. His lectures and seminars are always based on the most up-to-date results, he devotes utmost attention to raising the standard of phonetics education at the university. He is the author of numerous textbooks, lecture notes, and other types of teaching material all of which are based on and reflect up-to-date, exact methods of research.

In 1971 he became head of the Phonetics Department of the Linguistics Institute of the Hungarian Academy of Sciences. His task was not easy: he was to bring a modern experimental-phonetics laboratory into existence. Kálmán Bolla set out to fulfil his plans with immense energy and the results -- after having surmounted a lot of obstacles -- was the establishment of an internationally acknowledged workshop of phonetics. After heavy fights he has been able to start to issue 'Hungarian Papers in Phonetics' (of which 22 numbers have been published so far) which enabled Hungarian phonetics to become part and parcel of international phonetics. We receive publications in return, experts from abroad have visited our laboratory and relations could be established with a number of research institutes.

In 1986 he became head of the Phonetics Department of ELTE, so he took on a task that was similar to the first. He works with an immense optimism, never frightened by the difficulties, at the development of the university basis of phonetics. Here he embarked upon the publication of 'University Papers in Phonetics', the organ of the department.

His main area of research is linguistic phonetics, more specifically the physiology and acoustics of speech. He has achieved outstanding, internationally acknowledged results in the instrumental investigation of the mechanisms of speech articulation -- with the method of cineradiography, palato- and linguography etc. --, in the production of artificial Hungarian and Russian speech and in the research of suprasegmental structures. As the result of his research physiology and acoustics his conspectuses, have appeared, first in 1981 his important work 'A Conspectus of Russian Speech Sounds', followed by the conspectuses of six other languages.

Kálmán Bolla is an internationally acknowledged scholar. Among other things he is a member of the International Permanent Council of the International Congresses of Phonetic Sciences, the international editory board of Studia Phonetica Posnaniensia and the committee of the Hungarian Linguistic Society.

His life's work is imbued with high demands against himself and others, with consistency and with professional and human purity. We all wish that he shall be able to work through the amount of experimental results that he has gathered over the years and to fulfil his main intention to work out a sound typology based on interlingual phonetic comparisons.

Éva Földi

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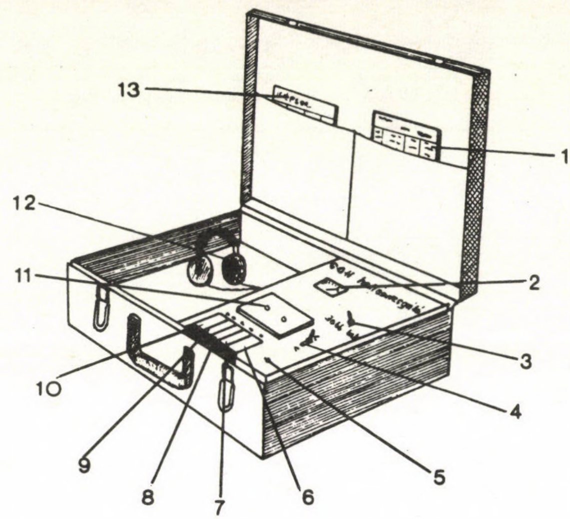
Key to Abbreviations

ALinguH	=	Acta Linguistica Academiae Scientiarum Hungariae
AUB SLingu	=	Annales Universitatis Scientiarum Budapestinensis de Rolando Eötvös nominatae. Sectio Linguistica
AUB SPhilol	=	Annales Universitatis Scientiarum Budapestinensis de Rolando Eötvös nominatae. Sectio Philologica
EFF	=	Egyetemi Fonetikai Füzetek [University Papers in Phonetics]
ELTE NyelvtDolg	=	Eötvös Loránd Tudományegyetem. Nyelvtudományi Dolgozatok. [Eötvös Loránd University. Papers in Linguistics]
MFF	=	Magyar Fonetikai Füzetek [Hungarian Papers in Phonetics]
ICPhS	=	International Congress of Phonetic Sciences
MNy	=	Magyar Nyelv [Hungarian Language]
MNyTK	=	A Magyar Nyelvtudományi Társaság Kiadványai [Publications of the Hungarian Linguistic Society]
NyK	=	Nyelvtudományi Közlemények [Papers in Linguistics]
Nyr	=	Magyar Nyelvőr [Hungarian Language Guard]
Proc.	=	Proceedings

G-O-H system



G-O-H is a system for hearing and speech perception examinations of children. The system uses phonetically based synthesised speech for the measurements.

The development of the G-O-H system was carried out at the Phonetics Laboratory of the Linguistics Institute of the Hungarian Academy of Sciences.

This new system operates by using synthetic words and solves the everyday problems in relation to measuring young children (ages between 3 and 8). The G-O-H system is very easy to use, no expertise is needed to perform measurements. The system provides information on the hearing capacity from 200 Hz up to 8000 Hz and also on children's global speech perception ability. The examination takes about 10 minutes and is interesting for the child.

The portable set consists of the following:

answer sheet (1), level meter (2), ear selector (3), switch for clinical/normal intensities (4), LED indicator (5), pause (6), start (7), stop (8), forward (9), rewind (10), casette containing the synthetic words (11), headphones (12), picture sheets (13)

There are about 300 G-O-H devices being used in Hungary: in kindergartens, speech therapy centers, audiological departments, clinics, hospitals, surgeries, etc.

The system is language-dependent and it can be applied to all human languages. The G-O-H system was applied also to German. Experiments by means of the German version of the G-O-H were carried out in Hannover (Germany) and in Wien and Graz (Austria). Part of these results was worked out for a dissertation which was defended at the Medical High School in Hannover. Attempts were made to apply the system to American English, these results were demonstrated at the International Congress of the American Acoustic Society in 1989.

SPEAKTRONICS-MULTIVOX, this multilingual text to speech system for IBM PC type computers is able to speak to more than 462 million people in their mother tongue, i.e. German, Italian, Finnish, Hungarian, and Spanish. Or even in Esperanto. Sooner or later it will be able to talk in many other languages as well, as it is under further development in the centre of Hungarian phonetic research, the Phonetics Laboratory of the Linguistics Institute of the Hungarian Academy of Sciences.

This device is the result of a long period of phonetic research and, on the other hand, of efficient technical development carried out at the Technical University of Budapest.

The SPEAKTRONICS-MULTIVOX system consists of
- the SPEAKTRONICS speech synthesiser box,
- power supply (220V/9V DC),
- driving software for IBM PC-s
- headphone
- manual

The application fields are:

Automatic information systems

bank services, databanks, travelling information

Industry

alarms by synthetic speech, process control

Scientific work

preparing special speech materials for psychological etc. experiments, phonetic studies, perception research, demonstration

Education

language learning aid for foreigners, spelling exercises for children, monitoring certain learning processes, etc.

Aid for the handicapped

automatic reading of any text for the blind, screen and keyboard echo, speaking facility for the deaf and persons with speech disorders

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